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AUTOMOTIVE INDUSTRIES

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Safety Overlaps S.A.E. Programs

Committees Launch Many New Projects at Annual Meeting

By Herbert Hosking

—So there was set forth in lights the phrase, "The S.A.E. is the melting-pot of all that's best in automotive thinking," and during the week beginning Jan. 12 the Society of Automotive Engineers in its annual meeting in Detroit, through the medium of 20 scheduled sessions with the help of nearly 1500 members and guests attending, gave meaning to the phrase.

Confirmation of a new group of officers headed by Ralph R. Teetor, in charge of engineering, Perfect Circle Co., as president, and presentation of medals and awards for meritorious papers and services presented to the Society, were the "business" of an an-

(*Turn to page* 74, *please*)

In This Issue

	Page
"Just Among Ourselves" at the S.A.E. Annual Meeting	78
S.A.E. Annual Meeting Papers	80
Chevrolet Trucks Have Improved Brakes and New Rear-End	90
Powerplant Development Is Keynote of the Motor Boat Show	92

Mather Spring Co. Strike Settled by Toledo Board

The strike at the Mather Spring Co. plant in Toledo was called off on Jan. 11 by a vote of the entire membership, and also those directly involved, without concessions on the part of the company. Several strikers were refused reemployment. Eight men guilty of vio-

(*Turn to page* 74, *please*)

Franklin Motors May Be Bought by a New Group

Negotiations are under way for purchase of the Franklin Motors, Inc., by Michigan and Eastern interests closely identified with the motor industry. The group which is said to have ample financial support, obtained a 60-day option on Jan. 8 from Toledo interests which had acquired the properties at the receivers' sale in Dec. 1934. Pending negotiations, the city of Syracuse has agreed to hold off foreclosure proceedings which it was about to institut to recover delinquent taxes. Plans involve operation of the plant as an automobile company. While unable to disclose details, a member of the group stated: "We had a definite purpose in mind in acquiring the properties."

Car Sales Now at the Season's Low

Extra Promotional Efforts Helping to Move Used-Car Stock

By Harold E. Gronseth

The motor vehicle retail market has quieted down somewhat since the first of the year, according to sales reports being received by the factories. While running at least double the rate of a year ago, deliveries in most instances are showing moderate declines from the December level, with some companies experiencing more extensive shrinkage.

Reports for the first 10 days of the month, however, are not a safe guide to the full month's volume, since the period includes New Year's Day and reflects also the anticipated post holiday lull. Later weeks, or 10-day periods of the month will provide a better indi-

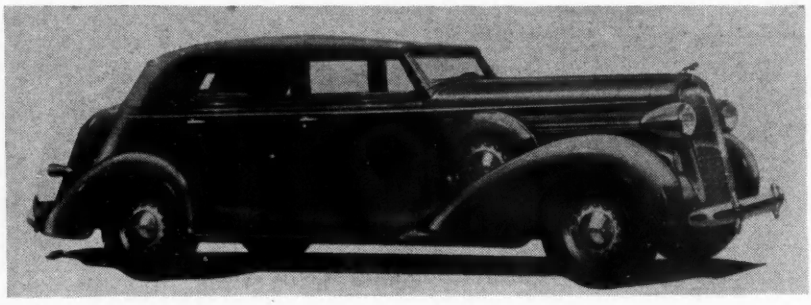
(*Turn to page* 75, *please*)

Campbell, Wyant Show SAE Members New Steel Piston

A new moly-silicon alloy steel piston was shown for the first time by the Campbell, Wyant and Cannon Foundry Co. at the S.A.E. annual meeting this week. Design, machining, and merchandising of the piston is to be carried on by the DeLuxe Products Corp., La Porte,

(*Turn to page* 75, *please*)

(Left) William B. Stout, retiring S. A. E. president; (center) Ralph R. Teetor, of Perfect Circle, incoming S. A. E. president who took office at the business session of the Annual Meeting in Detroit; (right) Col. H. W. Alden, of Timken, chairman of executive group of the incoming meetings committee, which will be responsible for coordinating and stimulating all programs arranged for further general meetings of the society



New convertible sedan model added to Dodge line

Tire Makers Consider FTC Sponsored Code

A trade-practice conference under auspices of the Federal Trade Commission has been proposed for the tire industry, including manufacturers, wholesalers, retailers and mass-distributors, for the purpose of formulating a voluntary code of fair practices which will eliminate all destructive competitive practices in the future. Industry leaders express the firm belief that manufacturers will agree to cooperate in such a conference plan provided mail-order houses, chain store systems and petroleum companies will do likewise.

If the response of industry members is favorable a date will be set for a preliminary conference either in Akron or Washington. The move is said to be the result of agitation started by the National Association of Independent Tire Dealers at its convention last November in New York.

While the retail price structure is the strongest the industry has known for many years, leaders point to the fact that there are many practices which still need definite correction. Perhaps the major of these is the unlimited road-hazard tire guarantee used primarily by mass-distributors, and defensively by tire manufacturers and dealers. It is claimed this guarantee costs the industry at least $7,000,000 annually in unfair adjustments.

Hope for a solution of the guarantee problem has been heightened by the recent statement of P. W. Litchfield of the Goodyear Tire and Rubber Co. that his company would drop the road hazard guarantee "at the earliest possible moment."

Car Fatalities Followed Population Curve in '35

Deaths from motor vehicle accidents in the United States rose last year to 36,400, compared with 36,101 in 1934, according to figures compiled by the National Safety Council. The slight decrease which had been hoped for earlier in the year was offset by a higher accident rate during the final months. The rate per population, however, did not increase, as the population is estimated to have risen 1 per cent during the past year.

The increase in deaths was less than might have been expected when the advance in motor travel is considered. Automobile registrations increased 4.3 per cent, and gasoline consumption approximately 6 per cent. The best showing in reducing fatalities was made by the Eastern States, where deaths were 3 per cent lower.

Convertible Sedan Added To Dodge Body Line

A two-purpose or convertible sedan model has been added to the Dodge line. Its body is said to be fully as rigid as that of the standard sedan type. The equipment includes two cleaners swiveled at the bottom of the windshield. Upholstering is in leather but fabric upholstery may be had if desired. The price is $995 f.o.b. Detroit.

Gorrell Named "Czar" of New Air Transport Group

Air Transport Association of America, including all scheduled air transport companies in the United States, was formed in Chicago this week. Col. Edgar S. Gorrell was chosen president and "czar" of the new organization.

Airline operators have withdrawn from the Aeronautical Chamber of Commerce to form the new group, although it was stated that friendly relations with the chamber would continue. It was felt that operators needed an independent organization to study their own problems. The chamber is primarily an organization of airplane and engine manufacturers. The purpose of the new association will be to coordinate schedules, engineering data, and other matters of policy among the different operators.

Col. Gorrell is 46 years old and has been a pilot for 22 years. He was graduated from West Point as an honor student in 1916 and during the war served as chief of the technical division of the air service in France and later became chief of its staff. After the war Col. Gorrell resigned from the army and was president of the Stutz Motor Car Co. for the six years prior to his resignation last August.

Briggs Manufacturing Co. has declared a regular dividend of 50 cents, payable Jan. 29 to stock of record Jan. 17. This places the stock on an annual basis of $2.

Wholesale Financing Increased 354% in Nov. Over Year Ago

A sharp increase in wholesale automobile financing last November, as shown in the Bureau of the Census, Department of Commerce, monthly report of automobile financing, resulted from the introduction of new models in that month. The increase amounted to 75 per cent over the month of October, 1935, and was 354 per cent higher than in November, 1934.

The number of new cars for which retail financing was provided increased by 50 per cent from October to November, and was 79 per cent above November, 1934. Dollar volume, however, increased only 43 per cent in November over the preceding month.

Average financing for each new car sold dropped from $576 in October to $549 in November, which is close to the figure of $547, the average in November, 1934.

	Wholesale Financing	Retail Financing					
		Total			New Cars		
		Number of Cars	Amount	Per Car	Number of Cars	Amount	Per Car
Nov., 1935	$136,160,556	243,435	$95,122,311	$391	114,170	$62,710,224	$549
Oct., 1935	78,577,367	221,655	78,903,776	356	76,411	44,024,207	576
Nov., 1934	30,556,373	162,783	58,085,294	357	63,749	34,861,719	547
11 Mos., 1935	1,248,182,022	2,864,773	1,055,234,223	368	1,192,050	655,119,643	550
11 Mos., 1934	869,363,451	2,285,596	846,912,314	371	999,421	550,513,707	551

	Used Cars			Unclassified		
	Number of Cars	Amount	Per Car	Number of Cars	Amount	Per Car
Nov., 1935	126,806	31,460,660	248	2,459	951,427	387
Oct., 1935	142,827	33,992,779	238	2,417	886,790	367
Nov., 1934	95,766	22,103,212	231	3,268	1,120,363	343
11 Mos., 1935	1,630,163	384,683,918	236	42,560	15,430,662	363
11 Mos., 1934	1,242,367	280,869,534	226	43,808	15,529,075	354

Motors Ordering for Future Steel Needs

American Producers Said To Be Interested in New Norwegian Alloy Plant

In some of the current purchases by motor car manufacturers the steel market sees more of a disposition to anticipate requirements than has been the case heretofore. Some of the large automotive consumers are said to have as their objective the covering of their entire first quarter's needs rather than those of merely the next few weeks. Detroit and Cleveland finishing mills, catering largely to automotive consumers, enjoy a much better operating rate than those in the Pittsburgh area. On the whole, sheet mill capacity is employed at a steady rate, with demand for full-finished automobile sheets somewhat more orderly, but quantitatively unimpaired. Some of the cold-rolled strip plants continue to have a large volume of rush orders to fill. Automotive business of bolt and nut plants has increased.

Reports continue to bob up of occasional price cutting by flat steel sellers in the Detroit market. European cable reports to the effect that a large alloy and tool steel plant is to be set up in Norway and that American interests are participating in this venture await clarifying. Reading between the lines of the so-far meager reports, one learns that chromium-alloy steels will come in for special attention. What American producers of these are principally interested in are the patent rights covering various compositions of the stainless type.

Another development of the week is announcement that one of the leading Middle West "independents" is about to install a battery of four new open-hearth steel furnaces. The significance of this lies in the fact that, while recent years have been rapid expansion of sheet and strip rolling facilities, this denotes the first noteworthy addition in three years to the country's raw steel capacity.

Pig Iron—While a shade more quiet, pig iron markets continue to enjoy a good small tonnage business from automotive foundries. New business now is at the full $1 advance which was announced six weeks ago, to apply to first quarter business. Blast furnace sales agents say that, while fourth quarter buying by automotive foundries was heavy, relatively little iron is in consumers' yards.

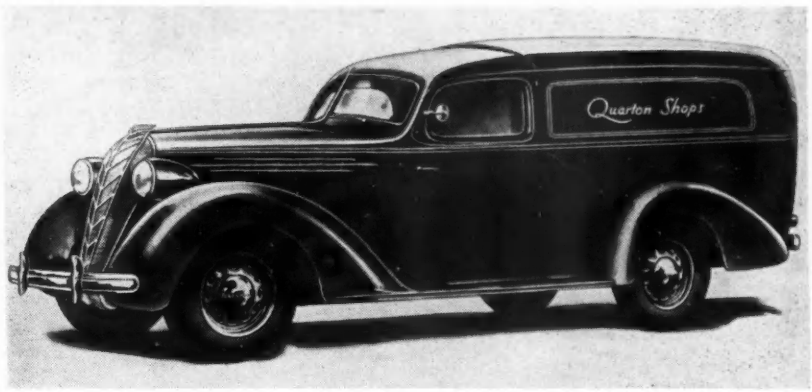
Aluminum—Primary aluminum prices are unchanged. Secondary metal is in good demand, with the market's tone steady to firm.

Copper—Consuming demand was decidedly backwards during the first half of the month. So far sales have amounted to less than half the rate at which copper was being bought in December, and much more activity is looked for during the second half of January. Advances of ¼-½ cent per pound have become effective for certain types of tubes and sheet copper. The market for electrolytic copper remains unchanged at 9¼ cents, delivered Connecticut point.

Tin—Better buying by American consumers and a shift in the dollar's value in favor of Pound Sterling served as a fillip to the market's languishing tone, resulting in an advance in the price of spot Straits tin at the beginning of the week to 47⅞ cents, compared with 47¼ cents at the preceding week's close.

Lead—Moderately active and unchanged.

Zinc—Dull and unchanged.



Terraplane now builds commercial line—this is the custom panel delivery car, capacity ¾ ton, wheelbase 115 in.

Hudson Builds Complete Line of Terraplane Trucks

The Hudson Motor Car Co. has entered the commercial car field with a complete line of Terraplane models, including a custom panel delivery, utility coach, ¾-ton cab pick-up express, custom station wagon and chassis with cab. All models are powered with the Terraplane motor providing 88 hp. (100 hp. optional) and have a wheelbase of 115 in. The duo-automatic hydraulic brakes used on the passenger cars are featured on the commercial models.

Extra large interior space, 130 cu. ft., is provided in the custom panel delivery model, which has a capacity rated at fully ¾ ton. A feature of the pick-up express model is the arrangement of the steel lockers which extend from front to rear on both sides of the steel box, squaring up the load space and concealing the wheelhouses. These lockers provide convenient space for carrying chains, tools, jack, etc.

Delabar Named Head of Bendix Marine Products

H. G. Delabar has been named vice-president and general manager of the Bendix Marine Products Corp., a new division of the Bendix Aviation Corp. For the past four years Mr. Delabar has been president and general manager of the Johnson Motor Co., manufacturers of outboard engines. He is a member of the executive committee of the International Engine and Boat Manufacturers Association. Mr. Delabar will make his headquarters in South Bend.

40 Years Ago

—with the ancestors of AUTOMOTIVE INDUSTRIES

The Daimler Motor Co., Steinway, Long Island, have advices from their superintendent, Mr. Fred Kuebler, now in Europe, that a consignment of improved Daimler carriages will arrive in New York about Feb. 1.

—From *The Horseless Age*, January, 1896.

ICC Issues Filing Rules For Motor Carrier Tariffs

Regulations were announced Monday by the Bureau of Motor Carriers of the Interstate Commerce Commission for the filing of tariffs by motor vehicle operators. The Commission recently extended until April 1 the effective date for rates.

In promulgating the regulations which govern the construction, filing and posting of tariffs and schedules, the Commission said that the regulations might have to be changed or amplified later but that before that is done there will be opportunity to study the schedules initially filed by motor carriers. All initial tariffs or schedules filed will be deemed to comply with the law, it was pointed out, unless and until they are rejected by the Commission with directions to file other tariffs in their place. In the event of such directions, the schedules already filed shall be the effective schedules until revised schedules have been filed.

Tariffs containing joint rates or charges applying in connection with rail carriers or railroad-owned water carriers are to be published and filed in accordance with Tariff Circular No. 20. Tariffs containing joint rates or charges applying in connection with water carriers, other than railroad-owned, are to be published and filed in accordance with the regulations just issued.

On Tuesday the Commission issued forms under Sections 213 and 214 of the Motor Carrier Act for applications to guarantee company lease obligations, to consolidate or merge, to issue securities, and to lease or acquire properties of other motor carriers.

Trucks and tractors take the stage in the first act of digging the 205-mile ship canal across Northern Florida

Tax Liens New Threat To Willys-Overland Co.

Tax liens may be a big factor in the eventual liquidation or reorganization of the Willys-Overland Co., Toledo, it became apparent this week when Daniel Holzemer, county treasurer, brought suit against the company for $98,897 in current and delinquent taxes on two small parcels of real estate including the administration building. Neither of the tracts of land cited in the case are necessary for manufacturing operations, although other office quarters in the plant would have to be provided.

Bondholders may eventually be faced with a tax lien substantially as much as their first mortgage, but having priority over it. Under reorganization, it is believed that some compromise might be effected on the tax claims, but on liquidation the county might take the property or make the bondholders pay dollar for dollar for the entire tax load.

Improvement in operations here and rapid sales of the Willys 77's being turned out by the receiver have been said to yield sufficient revenues to maintain the property. This advantage over an idle plant is the basis for the application for authority to make 15,000 more cars which will be heard by Judge George P. Hahn in Federal court here Jan. 20.

No Pre-Fabricated Houses Being Made in Car Plants

Busy enough in their own field, automobile manufacturers are not planning to build pre-fabricated houses as a sideline, according to the most reliable information from Detroit. The report that the industry's huge presses would soon be turning out insulated panels for steel houses has received such widespread notice, that one of the foremost companies has been forced to get out a form letter denying that it is considering the manufacture of such houses.

Production of the Air-temp conditioning equipment by Chrysler was perhaps partly responsible for the rumor. B. T. Moyer, Air-temp president, says that his company is experimenting with air-conditioning equipment in such houses, but is in no way interested in their manufacture. At present, automobile men are leaving the manufacture of the ultra-modern house to the steel companies.

Klee Back from London

E. T. Klee, formerly of the Standard Pressed Steel Co., Ltd., of Great Britain, Budd International subsidiary, has returned to the United States, and is making his headquarters at 2628 Cherry Street, Indianapolis. Mr. Klee would like to contact American companies interested in having their product manufactured under license arrangement in Europe.

Mack to Build New Light Truck Line

New Models Cover Range From ½-Ton, at $535, To 2-3 Ton, at $1035

Following close on the heels of rumors, Mack Trucks, Inc., this week announced their entry into the field of smaller trucks and buses.

The introduction of this new line marks a departure from the company's established field which for 36 years has been confined to heavy duty vehicles.

The Mack Junior line will include seven models ranging from a ½-ton truck selling at $535, to a 2-3-ton truck at $1,035, as well as a short-wheelbase traffic-type model.

In appearance, the new line will be featured by large fenders, a chrome grille, and forged disk wheels. Much that is ordinarily considered extra equipment, the Mack company intends to include with the list price, it is said.

The new bus models start at $2,700, and are available in three designs. One of the transit-type models will have a rear mounted engine.

Spanish Firm Planning Assembly of Chryslers

Special to Automotive Industries

Plans are being made to establish an assembly plant at Bilbao, Spain, for Chrysler, Plymouth, and DeSoto passenger cars, and Fargo trucks. The plant will be built and operated by the S.E.I.D.A.—Sociedad Española Importadora de Automoviles, S.A.—one of the largest automobile distributing companies in Spain, according to reports. It is expected that assembly operations will be under way before the end of the year.

Forty per cent of the parts, it is ex-

Swiss Reciprocal Treaty Doubles U. S. Car Quota

Annual quotas on American automobiles, trucks and chassis, and tires and inner tubes imported into Switzerland are increased under the terms of the Swiss-American reciprocal tariff agreement announced last week, to become effective Feb. 15, and to continue in force for three years. The quota on tires and tubes was increased from 6048 to 6912 quintals (220 lb.). The quota on passenger automobiles and trucks was increased from 2406 to 4812 units, an increase of 100 per cent. Duties on tires, tubes and motor vehicles were bound.

In explaining these concessions, the State Department pointed out that the Swiss import control has been particularly severe on automobiles. The quota for American automobiles, fixed at 2406, represented 50 per cent of Swiss imports of automobiles from the United States in 1932, when the value of this trade amounted to over $5,000,000. Owing to the granting of import permits in excess of the American quota in consideration of "compensation" purchases of Swiss goods, particularly the purchase of watches by American automobile firms, imports of American automotive vehicles into Switzerland did not, in fact, decline to much below 4000 units, the department said, and in 1934 stood at 4198 units. The new quota of 4812 cars and chassis is free of any requirement on the part of American firms to purchase merchandise from Switzerland.

pected, will be imported from the United States, and the balance will be of Spanish manufacture. Bilbao has many strategic advantages for such a plant. It is Spain's third largest city, has many industrial plants, and is the principal seaport of the republic on the Atlantic Ocean.

The new plant will be built and operated by Spanish capital. A group of Chrysler engineers will be sent from the factory to assist when operations begin. There is a possibility that French Peugeot and British Standard cars may also be assembled by the S.E.I.D.A.

Ford Experimenting With V-8 for a Light Airplane

The experimental model of a new-type small aircraft developed by the Ford Motor Co., and reported licensed by the United States Bureau of Air Commerce, is described as a two-seated cabin monoplane, powered by a Ford V-8 engine developed for aeronautical purposes.

W. J. Cameron of the Ford organization told AUTOMOTIVE INDUSTRIES that it is true a license has been applied for by the company, but since the plane is still in the experimental stages, no further information could be given out. Reports in the daily press that the government already had licensed the craft with Serial No. 1, that the model is known as Ford Model 15-P, that the craft is equipped with a Gardner wooden propeller, that the engine develops 115 h.p. at 4000 r.p.m. and has a cruising radius of about 500 miles, were called "purely imaginary" by the Ford spokesman.

Waukesha Motors to Be Run By Committee Until August

No successor to the late Harry L. Horning as president of the Waukesha Motor Co., Waukesha, Wis., will be elected by the board of directors until after the annual stockholders' meeting in August, according to J. E. DeLong, vice-president and general manager, who continues in that office. Meanwhile a management committee will continue in active charge of the company's operations, as for the past six years. The committee was created by President Horning for such an emergency as arose through his death. In addition to Mr. DeLong, members of the committee include James B. Fisher, chief engineer; C. P. Ross, assistant treasurer; J. G. Swain, sales manager, and A. S. Cronk, director of purchases.

Borella Named Assistant General Treasurer by GM

B. V. Borella, assistant treasurer, has been appointed general assistant treasurer of General Motors Corp., according to an announcement made this week by Alfred P. Sloan, Jr., president of the corporation.

NADA Used-Car Plan Calls for 20% Gross Profit, Rigidly Controlled

By DON BLANCHARD,
Editor, AUTOMOBILE TRADE JOURNAL

A program calling for the cooperation of manufacturers acting individually, and designed to put used car trading on a 20 per cent gross profit basis, was unanimously approved by the directors of the National Automobile Dealers Association at their annual meeting in New Orleans this week.

The program was developed by Jack Frost, general manager of the association, and in explaining it to the board, he said that it was practical and legal.

It is estimated that if it had been in successful operation last year it would have added more than $150,000,000 to dealer gross profit, which naturally raises a question as to whether this additional money could have been collected from the public without decreasing new car sales and gross profit. Anticipating this reaction, Mr. Frost was emphatic in stating that the program would not curtail new car volume. As to the annual cost of operating the plan, it was indicated that it might range up to $8,000,000.

The role of the factories in the plan would be for each of them individually, and without any agreement among them, to notify their own dealers that they were expected to put their used car tradings on the basis of a 20 per cent average gross profit; that they would require monthly reports on this score to see that this minimum standard was being met, and that failure to meet the minimum standard would be considered sufficient grounds for cancellation.

The grogram provides for the creation of a motor vehicle used car auditing board to which dealers would obligate themselves under bond to report regularly data reflecting the gross margin earned or gross loss sustained on used cars. Dealers subscribing to the plan would also agree to permit the auditing board to audit their books quarterly, and at any time to investigate their accounts to check the accuracy of their reports. The data thus collected would be compiled and published monthly by the board.

Under the bonding arrangement, dealers would subject themselves to monetary penalties for failure to make the required reports regularly. There would be no obligation on the part of the dealer under this phase of the program, however, to be guided by the information obtained by the auditing board in fixing allowances, nor to maintain any standard of gross profit on used cars.

It is proposed to finance the plan by having dealers authorize the factories to bill them $2 per car, which money would be turned over to the auditing board. On the basis of 4,000,000 annual volume this would amount to $8,000,000. Incidentally, the operations of this board would provide the information now being obtained through trade surveys on a much more comprehensive basis.

Another portion of the program provides for the organization of sales training schools in cooperation with state and local associations to improve the caliber of retail selling.

A description of the used car program is to be sent to the Federal Trade Commission. An explanation of the program is also to be printed and mailed to all dealers.

In discussing the plan, Mr. Frost quoted a telegram from R. H. Grant to the effect that the plan was not inconsistent with the aims of General Motors.

The directors also approved the creation of an automobile trade survey board consisting of a representative of the American Bankers Association, the finance associations, the U. S. Chamber of Commerce, etc. The object of this group is apparently to provide a sounding-board for data on automobile retailing developed by the association.

E. M. Lied of Omaha was elected president, suceeding F. W. A. Vesper, who was elected an honorary member of the board.

The 1936 program of the association includes in addition to the used car plan, a study of dealer mortality, comparison of dealer profits for the last three years, comparison of profit possibilities by makes, comparison of factory and dealer return on capital, comparison of contract provisions, state enabling acts for price maintenance, and continued negotiation with the Federal Trade Commission before which the association now has tentative proposals hitting at dishonest business practices and price discrimination.

John O. Munn has resigned as secretary of NADA and will return to Toledo to devote his time to his sales promotion business.

Alexander J. Gagnon

Alexander J. Gagnon, 57 years old, died Wednesday at his winter home in Miami, Fla. Mr. Gagnon was formerly vice-president of General Motors Corp., and vice-president and production manager of Fisher Body Corp. He is survived by his widow and a daughter, Mrs. William Book, of Detroit. Burial will take place in Detroit.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

General business activity continued to increase last week, despite some unsettlement, especially in commodity markets, attending the United States Supreme Court's A.A.A. decision. Wholesale trade last week was active and has been reported as the best in six or seven weeks. Both wholesale and retail inventories are low.

Freight Loadings Up Sharply

Railway freight loadings during the week ended Jan. 4 totaled 541,984 cars, which marks an increase of 75,305 cars above those in the preceding week, a gain of 44,710 cars above those a year ago, and a rise of 41,171 cars above those two years ago.

Food Prices Unchanged

According to the Bureau of Labor Statistics, the index of retail food prices during the two weeks ended Dec. 17 remained unchanged. The current figure stands at 82.0, based on the 1923-25 average as 100, as against 74.5 a year ago. The current average of retail food prices is 22.5 per cent below that on December 15, 1929.

Federal Reserve Index

The Federal Reserve Bank of New York has reported that the volume of production and trade in 1935 aggregated about 8 per cent above that in the preceding year. The production of manufactured articles last year continued to lead the recovery movement, showing an increase of approximately 14 per cent above that in 1934.

Lumber Production 14 Per Cent Higher for Year

The total volume of lumber business during the week ended Dec. 28 declined as a result of the Christmas holiday, but the daily averages for both new business and shipments were unusually high. Lumber production during the entire year 1935 was about 14 per cent above that in the preceding year, while both shipments and new business showed increases of more than 20 per cent.

Fisher's Index

Professor Fisher's index of wholesale commodity prices during the week ended Jan. 11 stood at 84.4, as against 84.0 the week before and 84.1 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Jan. 8 showed a decline of $1,000,000 in holdings of government securities. Holdings of bills bought in the open market and of discounted bills remained unchanged. Money in circulation declined $99,000,000, and the monetary gold stock increased $21,000,000.

ICC Member Says Railways Must Drop Losing Branches

Truck transportation is here to stay and that fact calls for revision of the railroad map, Commissioner Mahaffie pointed out in a dissenting opinion taking exception to the findings of Commissioners Meyer and Porter denying that part of the application of the Kansas City Southwestern Railroad for permission to abandon a 5.1-mile line from South Haven to Geuda Springs, Kan. The majority opinion granted the application of the railroad, owned and operated by the Santa Fe, to abandon the line extending from Geuda Springs to Arkansas City, Kan., because of the poor condition of the line, the high cost of maintenance and the loss that would be entailed by its operation.

Protesting that the application should have been granted in its entirety, Commissioner Mahaffie said that the applicant has shown that it will operate the segment required to be kept in operation at a continuous out-of-pocket cost of around $6,000 per year.

"This case presents a situation that is common," said Commissioner Mahaffie. "Much railroad mileage built in the days of wagon-hauls over dirt roads has been rendered obsolete by the development of trucks and by road improvement. To continue to maintain and operate such mileage is an economic waste. It unnecessarily burdens other transportation, and the shipper, as is customary in the case of wasteful transportation, ultimately must make up the loss. Truck transportation is here to stay. That fact calls for revision of the railroad map. We ought not stand in the way of necessary revision. Railroad transportation is still essential. If it is to be maintained on a sound basis the railroad plant and service must be adjusted to present conditions."

NSPA Expects Membership Rise to 600 This Month

Membership in the National Standard Parts Association is expected to jump to about 600 individual concerns late this month when the membership committee meets. More than 50 jobber and manufacturer applications now on file constitute, according to the Detroit headquarters of the association, the largest number ever considered at any one committee meeting. Filing of membership applications has followed closely the announcement of the reduction of annual dues to $100 for jobbers and $200 for manufacturers.

Only Impounded Taxes to Be Returned to Tire Companies

Rubber goods and tire manufacturers will share $2,000,000 as result of the Supreme Court's ruling declaring the A.A.A. unconstitutional, and ordering a return of all impounded processing taxes. However, manufacturers see little hope of recovering any part of the more than $10,000,000 in processing taxes that has already been paid to the Government.

The $2,000,000 fund which will be repaid on a pro-rata basis to the industry represents the amount of processing taxes from last May 1 to date, which rubber and tire manufacturers deposited in escrow pending the Supreme Court's decision. If tire manufacturers could prove in court that they did not pass any of the processing tax on to consumers they might stand to recover at least a part of the $10,000,000. While tire manufacturers did not increase tire prices the exact amount of the processing tax, they have more or less included the processing tax in the cost of the tire, the same as the excise tax. Broken down to the amount per automobile tire, the processing tax was only 15 or 20 cents.

A. G. Southworth

Augustus Glidden Southworth, president of the Glidden Buick Corp. and former manager of Buick's New York branch, died Jan. 14 of an attack of acute indigestion at his office in New York. He was 65 years old.

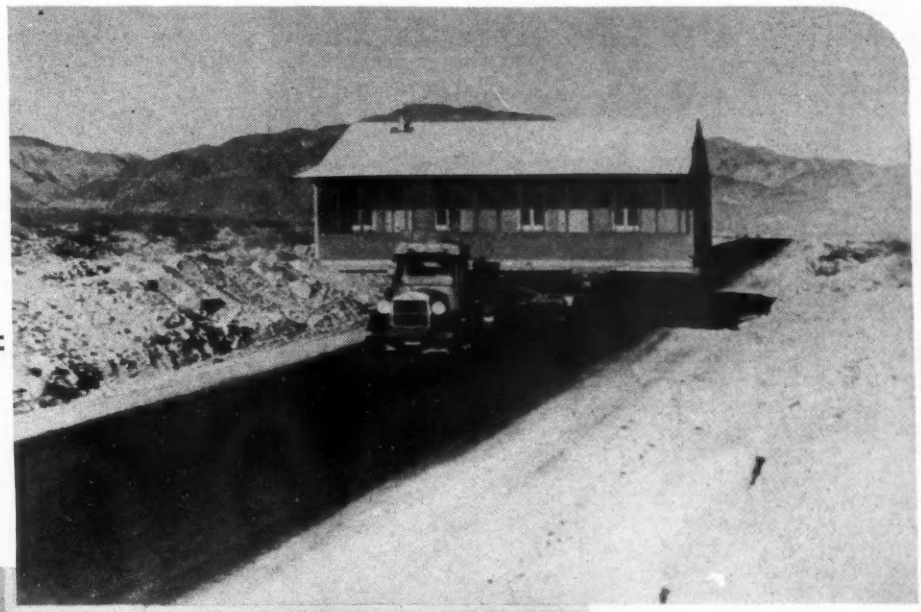
Mr. Southworth was a pioneer automobile dealer in New York and was twice president of the Automobile Merchants' Association of that city. He was born at LaCrosse, Wis., and was educated at the Brockport Normal School. Mr. Southworth is survived by his widow, two sons, Augustus R. Southworth of Englewood and Theodore Southworth of Brooklyn, a daughter, Mrs. Henry G. Gennert, Jr., and nine grandchildren.

Wallace Thompson

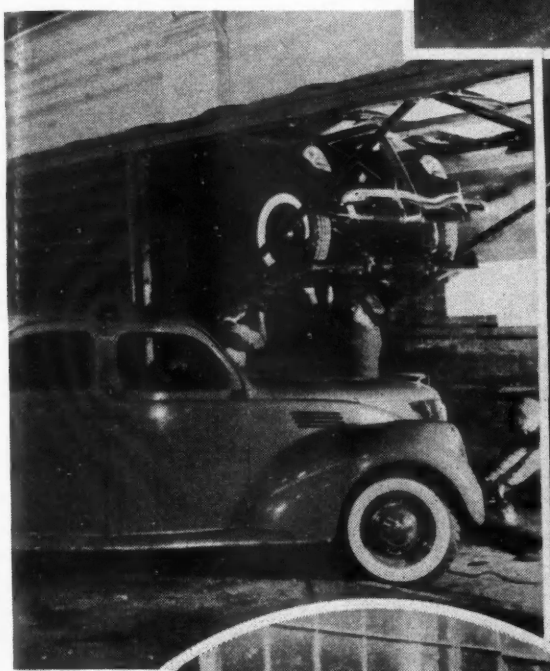
Wallace Thompson, editor of Ingeniería Internacional and a director of Business Publishers International Corp., died at his home in New York Jan. 7.

R. C. Brower, secretary-treasurer of Timken Roller Bearing Co., has been elected director to fill the vacancy caused by the death of J. G. Obermier. Mr. Brower has been with the Timken organization since 1916.

The World on Wheels



(Below) Pere Marquette railway has installed special loading equipment in 300 cars to handle Lincoln-Zephyr shipments



(Above) When the village of Cabazon burned recently, new houses were brought by 10-ton trucks from Yellow Canyon, 70 miles away

(Left) German motorcycle has a map holder built into the instrument board

(Below) Special trucks handle sound and lighting equipment for the movies when "on location."

Underwood, Wide World and European photos

(Left) A Pasadena inventor has built a heavily-padded invalid chair which is wheeled in and out of a sedan on two 5-ft. rails

Aluminum Castings Record Broken by Bohn Last Year

All world records for production of aluminum castings were broken by the foundries of the Bohn Aluminum and Brass Corp. which produced over 40,000,000 lbs. during 1935, giving Detroit the biggest aluminum foundry in the world, Charles B. Bohn, president, told members of the sales organization in Detroit. During the past ten years this company has turned out over 57,000,000 aluminum pistons, of which it is estimated that 45,000,000 are still in operation.

The Michigan Smelting and Refining Co., a Bohn subsidiary, during 1935 increased sales of non-ferrous ingot by approximately 70 per cent. Business on brass screw machine rods materially increased, and gains were shown by extruded aluminum and brass shapes and brass forging rods. It was found necessary to increase the capacity of the extrusion plan 25 per cent during the past year.

Many heat-treating ovens have been added by Bohn during the past year for the treating of aluminum castings, resulting in a more uniform and stronger metal without warpage or internal strain.

Bohn is the only company which makes all types of automotive bearings, and in 1935 turned out a greater volume of bearings than ever before. Heavy-duty bearing business was reported increasing, with many installations noted for such organizations as Caterpillar Tractor, International Harvester, etc. Installations are shortly to be made on the new railway journal bearing which will be tried experimentally by some of the leading railroads on the more difficult runs. The new bearings have an estimated life of better than 150,000 miles, as compared with the normal 15,000 miles maximum for previous types of journal bearings. They are materially lower priced than the roller bearings and tests so far show that they save materially, not only in installation and maintenance cost, but actually have far less friction than the roller bearings at operating speeds.

It has been found that heat-treating has made possible the use of aluminum in a number of places where plain untreated castings have not been successful. The lawn-mower industry is a good example of this. Heat-treated cylinder heads for automobile engines have proven to be far more satisfactory than the unheat-treated types.

Another industry which is turning to aluminum to an increasing degree is the shoe manufacturing machine companies. Large orders have been received by the Bohn company from United Shoe Machinery and others in that field.

Eric Ekstrom

Eric Ekstrom, a director and vice-president of Borg-Warner Corp. and president of the Mechanics Universal Joint Co., division of Borg-Warner, died in Rockford, Jan. 12, after a brief illness. Funeral services were held Wednesday in Rockford.

Born in Gothenburg, Sweden, 47 years ago, Mr. Ekstrom came to this country at the age of five. He became associated with the Mechanics Machine Co. in 1914. This company later became the Mechanics Universal Joint Co. He was quite active in the formation of Borg-Warner Corp. in 1928. Mr. Ekstrom was also a director of the Forgings and Stampings Co., Rockford Drop Forge Co., Rockford Metal Specialties Co., and the Pierson Co., all of Rockford, and the Lipman Refrigerator Co. of Beloit, Wis.

Grey-Rock Using Sound Films to Promote Sales

Grey-Rock products will be merchandised this year with the help of two half-hour AudiVision sound-film productions. The first production, entitled "Reap Year," describes the sales plan behind the line of Grey-Rock automotive products, and the second film, "Balanced Brakes for Profits," dramatizes the Grey-Rock Recommendation Guide and the Grey-Rock plan for balancing truck and bus brakes. Field men have been equipped with projection machines, and are using the films in their promotion work.

William L. Studebaker

William L. Studebaker, chief inspector at Fisher Body unit No. 1, died last week at his home in Flint of a heart attack. He was 52 years old.

Nash Motors Co. reports net loss of $610,227 for the year ending Nov. 30, compared with loss of $1,625,078 during the preceding year. Current assets on Nov. 30, including $24,520,514 cash and U. S. government securities, amounted to $28,625,698, and current liabilities, $2,537,014.

Mather Spring Co. Strike Settled by Toledo Board

(*Continued from page* 67)

lence were tried and convicted in police court shortly before the vote was taken to end the strike.

The plant will operate, so far as practicable, on a 40-hour week, paying overtime of time-and-a-half after 48 hours, and on Sundays and holidays. This is in accordance with A. P. E. M. practice. With the exception of those refused reemployment, the men will be taken back on a seniority basis, subject to the judgment of the management as to differences in ability. No wage increases were granted.

Settlement of the strike was largely brought about through efforts of the Toledo Industrial Peace Board and of employees not in sympathy with the strike.

Safety Overlaps S.A.E. Programs

(*Continued from page* 67)

nual meeting, which on the technical side brought forth many papers of broad interest.

More than 50 committees met during the course of the meeting, launching in many cases projects which will have a vital effect on every phase of automotive engineering.

Most important of the invited guests at the meeting, overshadowing men and technical controversy, was the topic of "highway safety." For this topic the meeting was liberty hall. It stuck its head into corridor deliberations, the engineering exhibit, committee meetings, and in many sessions where it wasn't on the program.

Two weeks in advance of the Jan. 16 dinner at which the Detroit Section was host to the national society, presenting as principal speaker, F. M. Zeder, of Chrysler, every available seat was sold. Mr. Zeder's subject was "The Place of the Engineer in Management."

At the dinner awards were presented as follows: To Dr. W. F. Durand, the Daniel Guggenheim Medal; to Guy E. Beardsley, the Charles M. Manly Memorial Medal of the S.A.E. for the best paper on aircraft engines, or an allied subject, presented to the Society during 1935; to Ben O. Howard, Roscoe Turner and Russell Thaw, Bendix trophies for various speed records in aviation.

Officers for 1936-7

Officers and members of the council for 1936-37 of the Society of Automotive Engineers are: Ralph R. Teetor, president; vice-presidents, Mac Short, representing Aircraft Engineering; Opie Chenoweth, representing Aircraft Engine Engineering; F. M. Young, representing Diesel Engine Engineering; T. B. Rendel, representing Fuels and Lubricants Engineering; E. H. Smith, representing Passenger Car Engineering; R. J. Waterbury, representing Passenger Car Body Engineering; K. L. Herrmann, representing Production Engineering; A. W. Lavers, representing Tractor and Industrial Power Equipment Engineering; H. W. Drake, representing Transportation and Maintenance Engineering, and Adolf Gelpke, representing Truck, Bus and Railcar Engineering.

J. A. Anglada, Louis Schwitzer, and Alex Taub are councilors.

David Beecroft is treasurer.

Car Sales Now at the Season's Low

(*Continued from page 67*)

cation of the trend of mid-winter sales.

Some executives are of the opinion that the industry is experiencing the seasonal low point at this time, and expect sales to start climbing again toward the end of January. Others, less sanguine, do not look for an appreciable upturn until near the first of March. They feel that heavy used car stocks will act as a brake on new car sales until dealers' inventories of such vehicles can be lightened by the normally accelerated spring movement.

Used-car sales have been stimulated materially by the extra promotional effort being put into the business by both factories and their dealers. Increased volume is reported all along the line. Dealers generally are stressing the point that a better selection of used cars at bargain prices are now available than at any recent time, and their sales are running well above the usual seasonal trend. But despite the increased activity in that department of the business, used-car stocks are still climbing, although the rate of accumulation has been slowed down considerably.

On the basis of December reports to factories, it is estimated that dealers delivered 243,000 passenger cars and 39,000 new trucks, or a total of 282,000 vehicles last month. This is a decline of approximately 10 per cent from the 310,000 units delivered in November. Registrations in November lagged about 17 per cent behind actual deliveries reported by dealers, and totaled 257,878 units. A corresponding lag in December registrations would indicate that about 235,000 vehicles were titled last month.

Some curtailment has taken place in plant operations. Schedules which indicated an output for the current month upwards of 375,000 units have been shaded somewhat to conform more closely with the trend of retail sales.

Buick

Buick Motor Co. produced 107,611 cars in 1935, an increase of 36.6 per cent over 1934, and the highest annual output since 1930. Domestic retail deliveries reached 92,126 against 64,899 in preceding year, a gain of 41.9 per cent. Including export sales, world deliveries of Buicks totaled 100,171 units compared with 73,516 in the previous year.

Domestic sales during the last 10 days of December were 5147 units, bringing the total for month to 13,456. This was the biggest December volume in the history of the company, surpassing the previous record for this month established in 1927, when December sales totaled 12,324. December deliveries compared with 13,319 in November, and with 4338 in the corresponding month last year. December production was 16,738 units, as against 4848 in the corresponding month last year. Schedules for January call for output of more than 15,000 cars.

Hudson

Total shipments of the Hudson Motor Car Co. in 1935 amounted to 101,080 cars, of which 34,039 were 1936 models shipped in the last quarter of the year. Shipments of 101,080 cars in 1935 compare with 85,835 in 1934, and 40,982 in 1933. The 1935 total is the largest for any year since 1930.

Net profits of the Hudson Motor Car Company in the fourth quarter are expected to be sufficient to offset the loss of $250,561 in the first nine months and give the company a net profit after all charges and taxes for the year, according to A. E. Barit, General Manager. Profit in the last quarter of 1936 compares with a loss of $1,676,057 in the last quarter of 1934.

Chevrolet

Chevrolet Motor Co. announces total U. S. sales of cars and trucks in 1935 was 865,842—third largest in company's history . . . December sales were 80,327—new record for that month. . . . Fourth quarter sales of 207,140 broke all records for that period. Chevrolet dealers report sales of 1,425,209 used cars during the year, making a total of 2,291,051 new and used units in 1935.

Pontiac

Retail sales in the United States increased from 72,877 units in 1934 to 147,044 last year —a gain of almost 102 per cent . . . World production of Pontiacs in 1935 was 181,168 cars compared with 82,496 the year before. Domestic production amounted to 165,218, with exports of 9932 cars last year . . . Canadian output was up 156 per cent, with 5900 cars turned out in 1935.

Cadillac-LaSalle

Cadillac-LaSalle sales during December advanced to a new seven-year high . . . Sales in 1935 exceeded 1934 by 97 per cent, and 1933 by 188 per cent.

Studebaker

Deliveries of 5207 Studebaker passenger cars and trucks in December made an all-time high in production for 11 years . . . Best previous December was in 1925 when 5195 units were built.

Oldsmobile

A total of 155,528 Oldsmobiles were delivered in 1935, an increase of 111 per cent over 1934, and 65 per cent more than the all-time high of 95,837 units in 1929. All December sales records were broken last month when 14,659 Oldsmobiles were delivered—4771 of these in the last 10 days of the month.

Lower Finance Charges Help to Sell Used Cars

Used-car sales, as a result of reduced Hudson C. I. T. finance charges, are running far ahead of usual seasonal trends, according to Wm. R. Tracy, vice-president in charge of sales of the Hudson Motor Car Co. "As a result of lower down-payment and longer terms, up to 18 months, we are finding that considerably more used cars are now being sold than in the comparable period of the 1935 selling season. Hudson and Terraplane distributors show 22.5 per cent greater used-car sales for the first 12 weeks since the introduction of the 1936 cars. Our lower and longer term used-car financing policy was adopted coincidentally with the recently announced reduction on new car financing charges. On higher-priced used cars, lower down payment and longer terms than formerly have been provided."

South America's newest and most modern tire factory will be opened early in March at Montevideo, Uruguay. The plant will operate under a long-term government grant. Personnel of the new factory will be trained by V. B. Gay, tire construction engineer, and W. T. Stephens, chemist, both of the B. F. Goodrich Co. Charles Gardner, Goodrich mechanical engineer, has been in Montevideo since last November supervising installation of the machinery.

C. W. Bolan has been appointed assistant manager of advertising of Carter Carburetor Corp., St. Louis. He will be in charge of all product information and will assist in retail, direct mail and dealer advertising.

Motor Boat Exhibit Opens in New York

More than 200 Builders Show Latest Model Craft, Engines and Accessories

Technical developments of both major and minor importance in marine power plants stood out last night at the opening of the National Motor Boat Show in Grand Central Palace, New York City, as the fundamental keynote of the display.

Experienced motor boat men said it has been several years since this industry has shown such real evidences of an upturn in sales. A definite revival in buying during the year just closed was reported by many manufacturers and practically all are reported ready to step-up production during 1936 to meet the anticipated increase in demand. Stock boat builders have reported actual orders already in hand, and these reports have served to further bolster the optimistic attitude prevalent at the show.

More than 200 manufacturers of water craft, engines and boating accessories are exhibiting this year in the three-floor display. A pre-opening view of the show indicated that this current exposition has been considerably expanded over shows of recent years. The show is staged in a blue and silver setting, and with sailing masts towering more than 40 ft. into the air, the effect is that of a vast marine scene. The show will continue until Jan. 25.

Campbell, Wyant Show SAE Members New Steel Piston

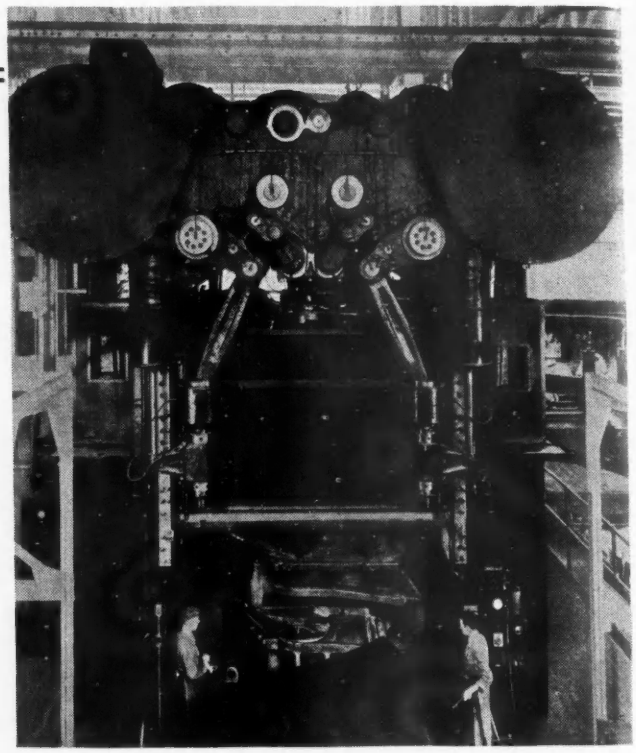
(*Continued from page 67*)

Ind. The material used in this piston is a cold melt electric furnace steel, heat-treated. It has none of the characteristics of cast iron. Tensile strength is between 100,000-110,000 lb. per sq. in.

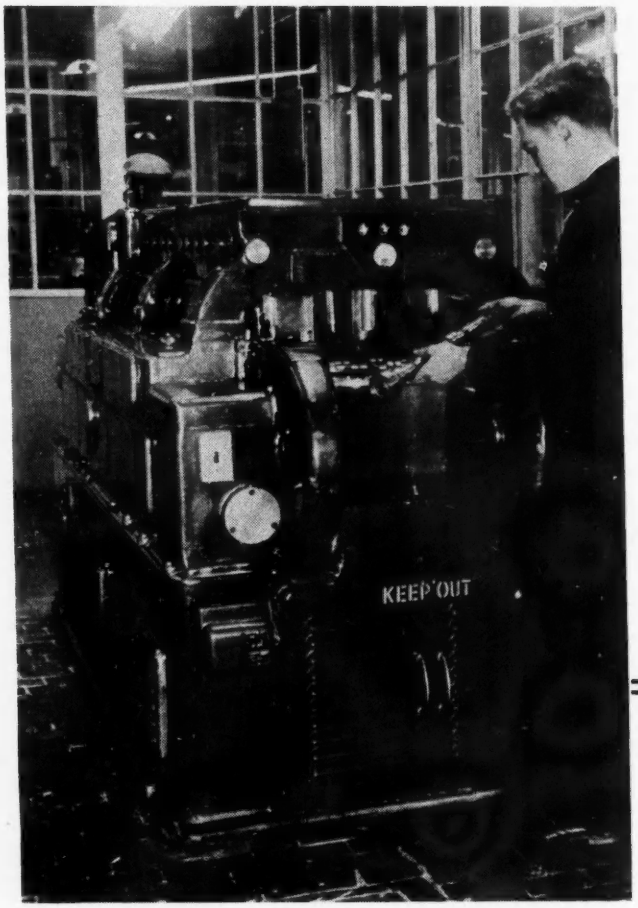
The high physical properties of the new alloy permit the production of castings with extremely thin walls, although the weight of the finish-machined pistons is comparable to that of aluminum pistons of the same size. The strength of the alloy steel sections exceeds any ordinary requirements. Test data indicate that the alloy steel piston produces less friction horsepower and promotes better cooling. The De-Luxe organization has facilities for producing these pistons in any quantity and is extending the development to Diesel engines of every size.

Dana to Speak at Toledo Real Estate Board Dinner

Charles A. Dana, president of Spicer Manufacturing Co., will address the Toledo real estate board at its inaugural dinner next Wednesday on the industrial outlook for Toledo.



Elephantine press at Ford's Rouge Plant —a triple-action 800-ton press, which will shape the rear quarter panels of tudor sedans in one operation, involving three moving slides carrying the dies. From flat metal four panels a minute are completed. Over 25 ft. high, the press weighs 600,000 lb. To support it, a caisson foundation 106 ft. deep and resting on solid rock was put in. Installed cost of each press—$90,000; showing that it sometimes takes $9,007.37 to put one Ford employee to work



Only perfect camshafts can pass this inspector —there are 25 measurements that must be checked on every Ford V-8 camshaft—this automatic electric inspector does it. Untouched by human hands, with their possibility of error, camshafts pass through this machine. Some of the measurements are made within a plus-or-minus of 25/100,000 in. (.00025 in.). If any measurement is outside the allowed tolerance, the shaft is automatically marked at the place it is out and discharged into a chute for rejects. This one machine inspects the entire camshaft output of the Ford's Rough plant.

Nat'l Aeronautics Assoc. Meeting Elects Officers

The two-day annual meeting of the National Aeronautics Association, held at the Mayflower Hotel in Washington, last week elected officers with Charles F. Horner unanimously chosen as president. Mr. Horner succeeds Sen. William G. McAdoo, whose executive assistant Mr. Horner was during the past year. Maj. Alford J. Williams, Navy flying star, now in the Marine Reserves, was elected vice-president, succeeding Maj. James H. Doolittle, famous Army speed pilot.

Benjamin King, Washington sportsman-pilot, was elected treasurer, succeeding John F. Victory, secretary of the Advisory Committee for Aeronautics. Mr. King during the past year established six world aviation records. Mrs. Louise Thaden was reelected secretary. There was an attendance of about 150, including 122 votes.

The keynote of the convention centered around plans for coordinating into one unit all aviation organizations of the country without subordinating any of the units. This policy was outlined by Major Doolittle as chairman of a special committee. That interest in aviation has been greatly stimulated was denoted by the fact that the membership of the National Aeronautics Association has jumped from a low of 1800 last spring to over 5000 at present.

Maj.-Gen. Oscar Westover, chief of the Army Air Corps, told the association that, as a step toward national security, the new General Headquarters Air Force must be built up to intended strength. He declared that it is the mission of organizations like N.A.A. to participate in a coordinated air defense program.

By-Lines

By Hendrik Willem Van Loon, "A World Divided Is a World Lost." Published by the Pamphlet House, New York, and distributed by the General Motors Acceptance Corp. with January issue of *News and Views*.

By Spencer Ervin, "Henry Ford vs. Truman H. Newberry: the Famous Senate Election Contest." Published by Richard R. Smith, New York.

"The Lincoln Highway," the story of a crusade that made transportation history. Published by Dodd, Mead & Co., New York.

Will J. Chappell, of Detroit, has been appointed advertising manager of the Timken Silent Automatic Co., according to an announcement just made by T. A. Crawford, general sales manager. Since 1930, Mr. Chappell has been assistant to Mr. Crawford. His new appointment became effective Jan. 1. Prior to joining Timken, Mr. Chappell was associated with the Detroit Steel Products Corp. for several years.

Goodyear's Nov. and Dec. Payrolls Increased 20%

The tire industry faces an opportunity to increase materially its dollar sales and earnings during 1936, in the opinion of P. W. Litchfield, president of the Goodyear Tire and Rubber Co. Citing the fact that the industry has a more favorable price situation than it has known for years, Mr. Litchfield predicted that 1936 would see more than a 10 per cent increase in the tonnage or physical volume of production of the tire industry over 1935.

"The tire industry in 1935 enjoyed the largest year in unit sales since 1931 and in tonnage output the largest in the history of the industry. Tire production in 1935 exceeded the industry's 10-year average while the tonnage of finished product was 75 per cent greater than the average for the past ten years, and was 5,000,000 pounds more than the top year, 1928," Mr. Litchfield said.

Goodyear officials released statistical data showing that the company's payroll distribution in November and December, 1935, was $800,000 greater than for the same two months of 1934—an increase of 20 per cent. This Goodyear November-December payroll was the highest of any year except 1928, and was 11.7 per cent greater than in 1926. The company's 16,000 employee total was 4,100 greater than 1932, the low year of the 10-year period, and was 800 above the 10-year average.

The Exporters' Encyclopedia

The Exporters' Encyclopedia, 1936. A complete export shipping guide. Published by Thomas Ashwell & Co., Inc., New York.

Reflecting the trend toward nationalism, the latest edition of this book shows more countries listed under new names than at any time since the war. Late changes include: Iran, Netherland India, Iraq, Ethiopia, Libya and the Philippine Commonwealth. The editors have also been obliged to recognize Manchukuo—unofficially. This is because shipping routes, consular regulations, mail rates, etc., are now all tied to Japan, rather than to China, as was the case in previous editions.

The book covers exchange regulations, currencies, radio, cable and telephone rates, legal holidays, ports and trade centers, shipping routes, population and territory statistics, customs regulations, and other information of value to exporters.

Berry's Council Meets And Names Committees

Tom Glasgow, Charlotte, N. C., delegate from the Motor Equipment and Wholesale Association, has been named as a member of the committee on work week, general wage and child labor of the Council for Industrial Progress organized in Washington recently under the supervision of Major George L. Berry, coordinator for industrial cooperation. Berry has proceeded with setting up the council and announced its agenda, though the council is made up almost exclusively of small industries that engage only a relatively small amount of labor.

Seven committees were selected. Each consists of eight members, divided equally between management and organized labor representatives. The committees in addition to the one on work week, general wage and child labor are: industrial policy, fair trade practices, American standards, government competition, anti-trust laws, and financial aid to small enterprises. The council was attended by 90 delegates representing management, and 30 representing labor.

Traffic Dictionary

Traffic Dictionary, by C. S. Nelson and George T. Stufflebeam. Third edition, 1935. Published by Shipping Service Organization, New York.

This traffic glossary is a compendium of domestic and foreign trade terms, phrases and abbreviations. Included in it are names and kinds of organizations, equipment and services employed in the preparation and handling of shipments.

Ford World Production Was 1,335,865 Last Year

World production of Ford cars and trucks in 1935 totaled 1,335,865 units, according to an announcement by the Ford Motor Co. This compares with Ford world production of 855,037 units in 1934, a gain of 56 per cent.

Production of Ford units in the United States and Canada totaled 1,272,885 units last year, a gain of 557,447, or more than 77 per cent, over the 1934 figure.

Franklin H. Smith

Franklin H. Smith, at one time a partner of Henry Ford in the lumber business, died at his home in Fresno, Cal., last week at the age of 82.

Clayton & Lambert Win Patent Infringement Suit

A decision in favor of Clayton & Lambert Manufacturing Co. in a patent infringement suit brought by Lyon, Inc., and Lyon Cover Co. has been handed down by Federal Judge John P. Nields of the U. S. District Court for the District of Delaware.

The Lyon companies had alleged infringement of two patents covering manufacture of metal covers for spare tires of automobiles and asked for an injunction prohibiting Clayton & Lambert from manufacturing the tire cover as well as a final accounting for damages. Both were denied.

The decision by Judge Nields points out that the Clayton & Lambert tire cover differs in important respects from the claims covered in the Lyon companies' first patent and states "it is perfectly apparent" that the Lyon patent was not infringed. A second Lyon patent the court found invalid.

Cord Plans to Produce 1000 Cars Next Month

Production of the new front-drive Cord will start with the week of Jan. 27, according to announcement made in Chicago last week by Roy H. Faulkner, president. Mr. Faulkner tells that the body assembly lines have been in operation for more than a week. Production schedules call for 1000 cars in February, which will be stepped up in March.

Dix & Sons of Memphis To Build Bodies for IHC

John C. Dix & Sons Co., of Memphis, Tenn., has received an order from the International Harvester Co. for 500 truck bodies. Officials of the Memphis concern expressed the opinion that this order is the largest of its kind ever placed with a Southern manufacturing plant. A. Goldfarb, manager, said the order amounts to approximately $60,000.

CALENDAR OF COMING EVENTS

SHOWS

National Motor Boat Show, New York, Jan. 17-25, 1936
Amsterdam, Netherlands, Automobile Show .....Jan. 31-Feb. 9
Germany, Automobile Salon, Berlin, Feb. 15-March 1
Finland, Automobile Show, Helsingfors .....Feb. 25-March 1
Austria, Automobile Show, Vienna, March 8-15
Hungary, Automobile Show, Budapest, Mar.-April
Switzerland, Automobile Show, Geneva, March 20-29
Illinois Automotive Parts Assoc., Maintenance Exhibit, Navy Pier, Chicago, April 4-8
Portugal, Automobile Show, Lisbon, begins April 16
Yugoslavia, Automobile Show, Zagreb, May 2-11
Spain, Automobile Show, Madrid, May 10-20
France, Automobile Exhibit at Foire de Paris .....May
Norway, Automobile Show, Oslo.....May

CONVENTIONS AND MEETINGS

S.A.E. Annual Meeting, Detroit..Jan. 13-17
American Roadbuilders Assoc., Cleveland .....Jan. 20-24
Assn. Highway Officials of No. Atlantic States, Atlantic City.....Feb. 12-14
American Society for Testing Materials, Regional Meeting, Pittsburgh, March 4
U. S. Chamber of Commerce, Annual Meeting, Washington .....April 27-30
American Petroleum Institute Mid-Year Meeting, Tulsa, Okla..May 13-15
American Society for Testing Materials, Annual Meeting, Atlantic City, June 29-July 3

JUST AMONG OURSELVES at the

S.A.E. Speakers Look to Future

SOMEWHERE during discussion of the thirtieth anniversary celebrations of the Society of Automotive Engineers last year it was mentioned that for 1936 it might be well for the society to signalize the beginning of its fourth decade of existence by turning its attention to the automotive developments of the future and to the institutional character which many of these developments possess.

At the annual meeting of the society which began in Detroit on Jan. 13, it is apparent that planning along the lines indicated formed a part of the thinking which went into preparation of the meeting's program, which is particularly rich in papers of general interest on fuels, metals, transportation, and production methods.

In the papers on specific engineering, there was noticeable a tendency to combine a review of fundamentals with excursions into the future. Many of the papers were of a character to stimulate discussion along broad lines. Of the discussion in general, our only complaint is that it was too polite.

Past Year Lifted Meeting Interest

THE society met in Detroit with a rather successful year back of it. Approval by the council of a group of membership applications brought the net membership to a figure above that at the same time last year. Attendance at section meetings gained 4000 in 1935 as compared with 1934, and the society was able, through its placement service, to find positions for a respectable proportion of those members who have been listed as unemployed. The plus signs were written as follows during the past year: The regional meeting plan was put into successful operation, a new section was added to the Southern New England territory (it held its first meeting on the sixteenth at Hartford), functioning of committees was speeded up in many cases and personnel of committees was strengthened all along the line.

Broader Programs Sought This Year

COMPLIMENTS came from many sides for the work of the 1935 meetings committee, which, under the chairmanship of A. L. Beall of Wright Aeronautical, had to its credit the successful summer meeting of the society at White Sulphur Springs last June, and arrangements for the present annual meeting which seems set to break attendance figures when the final count is made.

The incoming meetings committee, with the approbation of the outgoing group, took another step which is expected to go far in broadening the interest of programs of future national meetings of the society.

Appointed by incoming President Ralph Teetor as members at large of the meetings committee were: Col. H. W. Alden of Timken, O. E. Hunt, General Motors' vice-president of engineering, K. T. Keller of Chrysler, Dr. George W. Lewis of the National Advisory Committee for Aeronautics, and E. P. Warner, consulting aeronautical engineer. The new meetings committee moved promptly to constitute these men as an executive group responsible for the development of general policy for the conduct and program of future meetings, with Colonel Alden as chairman.

Before the annual meeting was over the executive group had presented an outline of some of the things it would like to see put into effect, beginning with two national "activity" meetings of the society scheduled for April, and the summer meeting at the end of May.

Where Seeing Is Believing

THE engineering display which has become a fixture at recent annual meetings of the S.A.E. demonstrated again its merits as a function at which engineers can meet informally for unhurried examination of new mechanical developments "in the flesh." There were 44 exhibits this year, arranged and decorated under the "stage management" of F. L. Faurote.

Highway Safety Takes Star Role

WITH discussion of highway safety leaking out of the session assigned to it, and being one of the topics of lobby discussion

S. A. E. Annual Meeting

throughout the meeting, the new engineering relations committee of the society came in for a good deal of attention. The function of the committee is to coordinate and guide the cooperation of the S.A.E. and its sections with other organizations which seek technical advice on regulatory and other aspects of safety. Such requests are growing in number, and fulfillment of them may become one of the most important general functions of the society within the next year or two.

Driver Ratings For More Safety

K. L. HERRMANN of Bantam Ball Bearing was among those who came to the meeting with a more-than-casual interest in the problem of highway safety. Mr. Herrmann advocates universal licensing of motor vehicle drivers, the license to take the form of a coupon book in which can be recorded the offenses the driver commits over a period of five years. Demerits incurred would be subtracted from an arbitrary figure to give a quick rating of the driver's behavior. Those whose average for five years was bad would receive various penalties ranging from having to carry a big warning sticker on their windshields, to jail sentences.

Samples of the simple form involved in such a system will be sent to anyone who writes Mr. Herrmann at South Bend, and he will be receptive to constructive comment on the idea as a whole, or any of its details.

Only Diesels in The Navy Now

DIESEL developments will probably come so fast within the next year that it will be difficult to keep track of them. Here's one of more than passing interest. The Navy has taken license from a prominent manufacturer of Diesel engines to manufacture at the old Navy gasoline-engine plant at Norfolk, Diesels of 25, 60 and 105 horsepower. This is part of a program under which the Navy will go 100 per cent Diesel on all its small-engine requirements formerly handled by gasoline.

The Norfolk plant is just about ready to go into production on the Diesels. As we understand it, there was little retooling involved. It is a matter of Navy policy that the manufacturer from whom the license was obtained is not permitted to use the Navy's name in any form of advertising. The whole transaction is regarded in some quarters as an institutonal boost for Diesels, and in consequence of this the manufacturer concerned is said to have been satisfied with a relatively small sum for the development work involved.

Is Gas-Engine Field Being Overlooked?

LOBBY talk at the S.A.E. meeting brought out another interesting point-of-view for engine designers. We happen to know of a rotary engine in the 600 horsepower class which is being developed for operation on natural gas. The particular engine is for use in pumping the gas itself through pipe lines, which is a fairly normal application, but, in talking with the designer, we discovered that wherever natural gas is being piped (and that's a lot of places and involves a lot of distances which haven't percolated to the consciousness of the automotive industry) there has been a tremendous stirring of interest in the possibilities of using internal-combustion engines for stationary-power uses formerly served by steam.

Every natural gas line is of course a potential source of fairly cheap fuel. We wonder if engine builders have followed out this condition to their full advantage, and we aim to find out more about it and present the facts to readers of this publication in the very near future. Meanwhile, we would be interested in comments from readers on the possibilities of such development.

Better Liaison With West

MIDDLE Western and West Coast sections of the society sent more representatives to the annual meeting than have been seen for a number of years. The society has made a consistent effort during the past year to better the liaison between sections in the East and those in the West and as a result has been able to add steadily to the truly representative character of general meetings.

—H. H.

S.A.E. Annual-Meeting

Anti-Vibrator System for Aero Engine Explained

IN a paper by E. S. Taylor of M.I.T., it was shown that torsional vibration of the rotating system of a radial aircraft engine can be prevented by applying a pendulum vibration absorber to the system, as illustrated diagrammatically in Fig. 1. It was shown in the paper that if a nine-cylinder radial engine (in which the harmonic of the gas-pressure torque which has a frequency equal to 4½ times crankshaft speed is the chief cause of torsional vibration) is provided with a pendulum for which the ratio r_1/L (distance of fulcrum point of pendulum from axis of shaft/length of pendulum) is equal to 4.5^2, and provided the pendulum is made sufficiently large, that harmonic of the torque curve which has a frequency of $4.5\ n$ will be neutralized. The operation of the device, moreover, is independent of the vibration characteristics of the system to which it is attached and is dependent only on the nature of the torque impulses. This is of great advantage, since the vibration characteristics of the crankshaft-propeller system are to some extent dependent on the propeller, over which the engine manufacturer has no control. Besides, the same device may be used without modification for both geared and direct-drive engines.

The effectiveness of the device is such that only a portion of one counter-

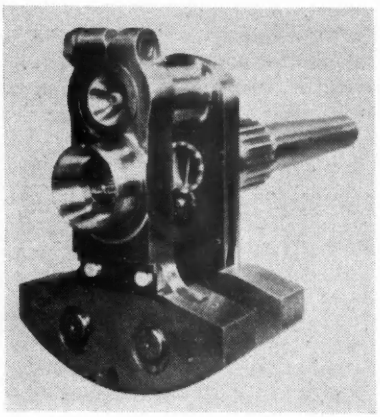


Fig. 2—Wright aeronautical anti-vibrator.

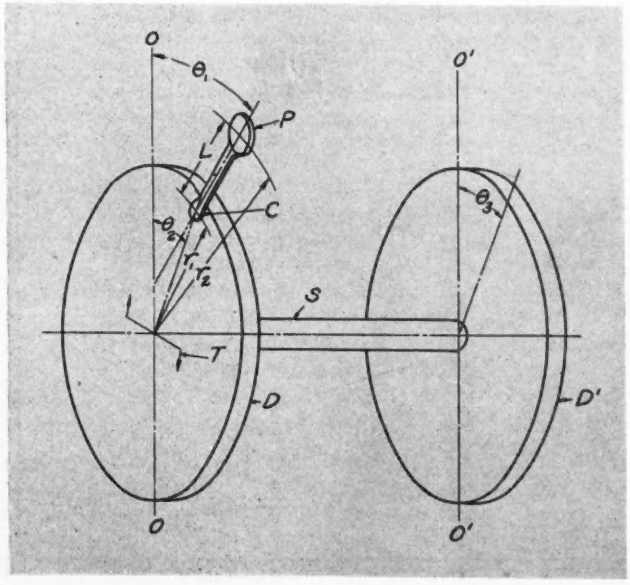


Fig. 1 — Shows how a pendulum vibration will prevent torsional vibration in a rotating system.

weight is necessary to make a sufficiently large pendulum, and it is not necessary to increase engine weight. However, it should be remembered that the balancing torque due to the pendulum is proportional to the square of the speed, and if large torques are required at low speeds, a relatively large pendulum must be provided. In the aircraft engine the torque is generally quite large during acceleration, and a pendulum larger than that required for steady running may be desirable.

Following are some of the advantages claimed for this device:

Owing to the cancellation of the torque harmonic of frequency $4.5\ n$, the maximum instantaneous torque acting on the crankshaft is reduced, and the stress in the shaft may be less than that computed from the maximum torque supposed applied statically.

Papers — Outline Tomorrow's Technical Problems

Since the pendulum balances the torque harmonic of frequency 4.5 n, vibration of this frequency is impossible with either a single node or with two or more nodes in the crankshaft. No energy is converted in the process of eliminating the vibration, and there is, therefore, no additional heating effect inside the crankcase. The device incorporates no springs and its adjustment is not affected by changes in temperature or by wear, in which respect it differs favorably from viscous—and solid—friction dampers.

The desirable features of this type of vibration absorber led the Wright Aeronautical Corp. to undertake to incorporate one in the "Cyclone" engine. Two difficulties arose: First, it is not possible to achieve the desired frequency of 4½ cycles per revolution by swinging a counterweight from a pivot. If the center of gravity of the counterweight is 6 in. from the center of the crankshaft, the required simple pendulum length is about ⅜ in. If a compound pendulum is used, its radius of gyration referred to its center of gravity must not be greater than 3/16 in., or it will not be possible to obtain the desired frequency, no matter where the pivot point is located. Since the radius of gyration of the counterweight about its center of gravity is many times 3/16 in., it is not possible to use the counterweight swung from a single pivot as a compound pendulum, nor is it possible to use a part of the counterweight, as any mass which can be put in a crankcase and which has a radius of gyration of 3/16 in. will be hopelessly small for the purpose. Even if it were possible to obtain the desired frequency by swinging a mass from a pivot, a bearing subjected to the necessarily high centrifugal loading would be undesirable, because the device depends for its effective operation upon the absence of appreciable friction.

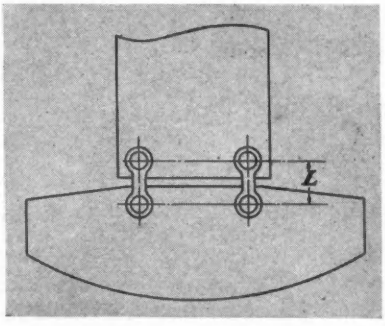


Fig. 3—The counterweight is supported from two links and acts as a simple pendulum

These difficulties were cleverly overcome in a design originated by R. Chilton of the Wright Company and illustrated in Fig. 2. The counterweight is supported on two rollers which are loose in holes in both the counterweight and the crank cheek. It will be readily seen that this arrangement is equivalent to suspending the weight from two links as shown diagrammatically in Fig. 3. With this suspension, all points of the counterweight are constrained to move in circular paths, and since the counterweight has parallel motion when it is displaced, it behaves as a simple pendulum of length L (Fig. 3). By the use of this arrangement, it is easily possible to obtain the desired frequency of 4½ cycles per revolution. The use of the entire mass of the counterweight in the device provides an ample margin, so that its amplitude is small even during rapid acceleration from low speeds. At the same time, the use of rollers solved the problem of friction.

The device described gives relief only from torsional vibration of a frequency equal to 4.5 n, where n is the crankshaft speed. This is by far the most troublesome frequency in a nine-cylinder radial engine. If the frequency 9 n should also give trouble, a second pendulum may be fitted.

New Production Methods Brings Die-Casting to Front

THE automotive industry is the largest single user of die castings, according to J. C. Fox of the Doehler Die Casting Co., who read a paper on "The Place of Die Castings in Automotive Design." He estimated that in 1935 the average passenger car carried 25 lb. of die castings, one model carrying no less than 80 lb. Because of the recent introduction of die-cast radiator grilles, radiator grille frames, side louvers and moldings, the average weight of die castings per car will be materially greater in 1936.

Closer contact between the engineer or designer and the die-castings producer was urged by the author, who thought it would result in lower die costs, lower casting costs, and lower cost of finishing. Very often radical

Tests of Die Castings Used in Automotive Industry

	Original Properties	After 10 Days Steam Test at 203° F.	After 1 Year Dry Heat at 203° F.	After 3 Years Indoor Aging Room Temperature
Alloy XXI				
Tensile Strength (lb./sq. in.)	48,000	45,000	39,000	49,000
Charpy Impact Strength (ft. lb.)	18	1.50	1.50	6.0
Brinell Hardness	83	93	71	106
Elongation (Per Cent in 2 in.)	5	1.0	1.0	5
Dimensional Changes—inches per 6 in. length	....	0.0118"	0.0223	0.0022
Alloy XXIII				
Tensile Strength (lb./sq. in.)	40,300	33,200	31,000	33,800
Charpy Impact Strength (ft. lb.)	20	22	21	21
Brinell Hardness	74	..	55	67
Elongation	5	5	8.8	6
Dimensional Changes—inches per 6 in. length	....	0.0045	0.0016	0.0006

changes are made in the design of a part after the die for same has been started, necessitating the rebuilding of the die.

The automotive industry has standardized on die castings for body hardware, carburetors, fuel pumps, lamp housings and brackets, instrument panels, and radiator ornaments.

Because of their excellent physical characteristics, high speed production and low cost, zinc-base die castings lead all other types in automotive construction. Aluminum-base alloys are still being used for many automotive applications. The new copper-base die castings with their superior strength and corrosion resistance are steadily forging to the front and their consumption is gaining rapidly. Tin and lead-base die castings are not being used sufficiently to warrant further discussion.

Dimensions, weights and descriptive details were given in the paper of radiator grilles for eight passenger-car models made by the author's firm. Previous to the adoption of die-cast radiator grilles the largest die castings weighed about 17 lb. Some of the grilles weigh as much as 23 lb. when finished, and as much as 30 lb. with gate and fin. Special die-casting machines had to be built to hold the large and heavy dies and the special auxiliary equipment, and conveyors were installed for handling these large castings. The weights of the finished grilles listed range from 13 to 23¼ lb.

In the early history of zinc-base die castings there was a good deal of trouble from rapid deterioration, swelling and cracking in hot humid atmospheres, as in the tropics and sub-tropics. To simulate these conditions, the steam test was devised, in which the parts are exposed for 24 or 48 hours to an atmosphere saturated with moisture (100 per cent humidity) at 200 deg. F. The alloys now used for die casting are more resistant to this form of attack, and the present value of the steam test lies in its ability to readily detect the presence of such impurities as lead and tin in amounts of over 0.01 per cent.

What is known as the dry test, consisting in exposing the parts to a temperature of 203 deg. F. in a dry atmosphere, shows the change in dimensions and in physical properties with time. Many die-cast parts are subjected to high temperatures either while being finished (japanned) or in service, hence the importance of this test. This test is really an accelerated aging test, and the above tables furnished by the New Jersey Zinc Company, show test results obtained from two different zinc-base die-casting alloys by the different tests applied in the industry:

Great purity of all of the metals used in the alloy is quite essential. The zinc is specified as of 99.99 per cent purity, and good practice calls for the use of electrolytic copper of 99.9 per cent purity, 99 plus per cent aluminum, and 99.9 per cent magnesium.

Compared with the zinc-base production, aluminum-base die-castings are used only to a limited extent in automotive production, and then on account of their characteristic properties, including lightness, high thermal and electrical conductivity, freedom from dimensional changes, corrosion resistance, stability of properties at subnormal temperatures, and ability to hold a polished luster for long periods. Typical automotive applications of aluminum-base die castings are magneto housings and igniter parts, speedometer parts, booster-brake end plates and fuel-pump adapters.

Aluminum-base die castings for the most part are simply polished to a high luster which is retained over indefinite periods without change. The retention of luster is due to the formation of a thin film of protective oxide.

One of the best means for treating aluminum materials both for protection as well as for decoration is by the anodic oxidation process. In this process a heavy oxide coating is produced artificially on the surface by making the article to be treated the anode in a suitable solution with a definite EMF applied. An extremely tenacious oxide film is produced, which is resistant to moisture, salt water, and other corrosives. This oxide film is formed of the metal itself and will not chip or flake off in use. It is capable of taking on certain types of aniline dyes or mineral pigments permitting a great variety of color possibilities. The coating is also capable of absorbing oils and waxes, which enhances the protection.

A number of automotive parts are now being pressure die-cast from copper-base alloys. One of the most interesting is a master cylinder piston for a hydraulic brake system which is being produced at the rate of 8000 per day. A copper-base die casting was chosen for this use mainly because of high corrosion resistance necessary in the media used for the brake fluid. Other copper-base die castings are used because of their high strength and resistance to shock and where the properties of other die-cast metals are not high enough for a particular use.

The standard alloys most suitable for this process are those having melting points in the range of the 60-40 type brass composition, i.e., 1600-1650 deg. Fahr. Higher melting-point alloys, such as the bronzes, can be readily cast by this process, but the added heat absorption into the die surfaces due to the higher casting temperatures necessary affect the die "life" adversely.

During the past few years a considerable amount of development work has been done with reference to the die casting of magnesium-base alloys, but no castings of such alloys are being produced for automotive use at present. The advantages of these alloys are their extremely low specific gravities, their excellent machinability, and the fact that molten magnesium alloys, unlike molten aluminum alloys, have no action on iron parts in contact with them.

Fuel Requirements of Diesel Engines

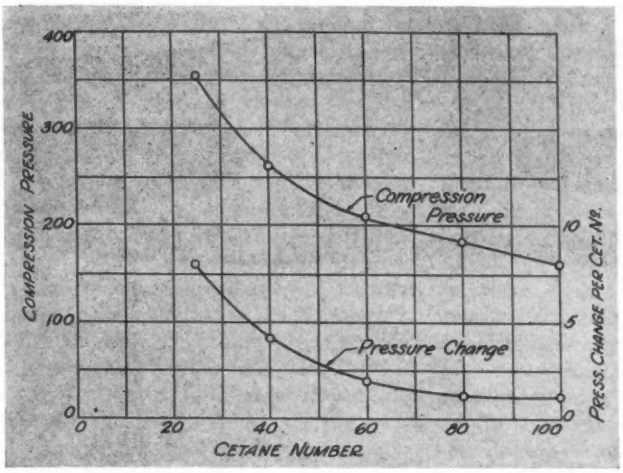


Fig. 1 — Critical compression pressure of Cetane blends

DIESEL engines have distinct minimum requirements with respect to fuel ignition quality; the minimum quality varies with the operating conditions and no essential difference in the performance can be observed with different fuels provided the minimum ignition quality is exceeded. For all practical purposes, therefore, no correlation appears possible between the laboratory rating of fuels and their service behavior.

The above are some of the conclusions drawn from research work on Diesel fuels dealt with in a paper by J. R. MacGregor of the Standard Oil Company of California, entitled "Diesel Fuels—Significance of Ignition Characteristics." Mr. MacGregor made his tests with a converted C.F.R. test engine and used the critical compression *pressure* as the criterion of ignition quality of the fuel. The ignition quality of the fuel is determined by varying the compression ratio by increments until the point is reached where ignition just occurs; then the compression pressure is determined, and from a frequently checked calibration curve the cetane number is assigned. At first there were considerab'e variations in the calibration, due to the variability of the cetane then used, but this trouble has been eliminated by the adoption of cetane, which is being supplied by the duPont Company.

Fig. 1 shows the relation between critical compression pressures and cetane numbers and also the change in the critical compression pressure per cetane number at various points of the cetane-number scale. With high cetane numbers a change of one number does not make much difference in the critical compression pressure (about 1 lb. per sq. in.) while with low cetane numbers the difference increases up to 7½ lb.

The effect of nozzle opening pressure on the critical compression pressure was studied on two fuels of different viscosities. The C.C.P. varied with the injection-valve opening pressure, but the curves representing this relationship for the two fuels crossed. For an injection pressure of about 2650 lb. both fuels had the same C.C.P., while with an injection pressure of 3000 lb. the fuel of higher Saybolt viscosity ignited more readily and at 2000 lb. the fuel with the lower Saybolt viscosity, the difference between the C.C.F's in both cases being of the order of 10 lb. per sq. in.

The laboratory tests showed conclusively that the ignition quality of a fuel is not a fixed factor but must be considered in terms of the engine in which the fuel is used. Tests were therefore made on a number of popular high-speed Diesel engines, in which use was made, in addition to the usual apparatus, of special means for measuring the exhaust smoke density, and for determining the time during which a unit of fuel was consumed. The latter device included a stop watch operated by a double trip, under electrical control of the unit being timed. Provisions were made for actuating additional circuits simultaneously with the starting and stopping of the watch. One of these additional circuits actuated the dynamometer counter used as a check on the tachometer. The smoke meters, which yielded very reproducible results, consisted of a light source and a photronic cell suitably mounted in pipe fittings. Both the cell and the light source were protected from fouling by glass screens and each of the assemblies could be removed for cleaning. Valves were provided for by-passing the exhaust through the unit only when examinations were to be made. A mild draft of air was provided on the exhaust side of both the light source and the photronic cell in order to purge the cross arms of exhaust smoke at all times. In making a determination, the lamp is first turned off to establish the 100 per cent smoke point. It is then turned on and successive readings are obtained in rapid succession with and without ex-

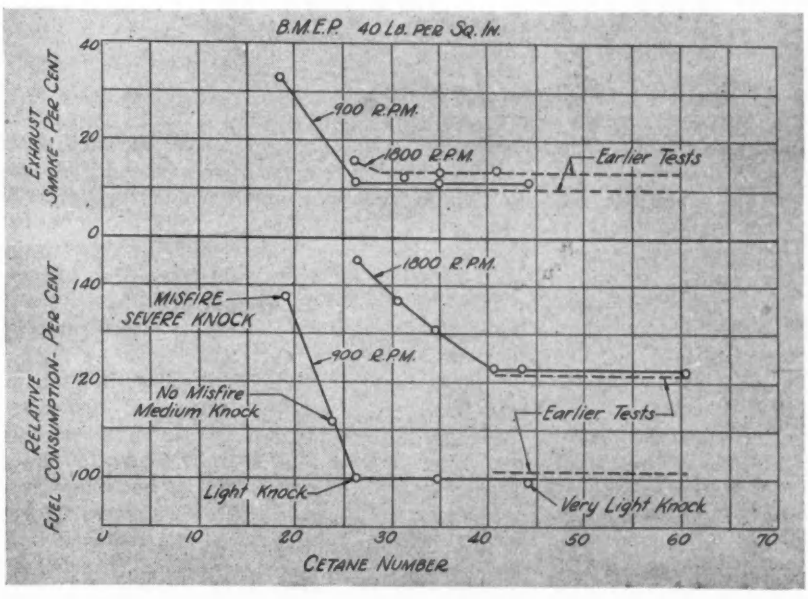


Fig. 2—Chart showing significance of ignition characteristics of Diesel fuels

haust gas passing through the unit, to determine the readings for the smoke and "0-smoke" conditions. Relative exhaust-smoke density is then assigned proportional to the "0" and "100" readings by reference to the calibration of the photronic cell.

Starting tests with one of the engines showed that at moderate temperatures, 60 to 70 deg. F., the engine would start immediately on any of the fuels used in the test, which ranged between 25 and 60 cetane numbers. At 35 deg. F. starting was equally easy with all fuels having cetane numbers above 35. Subsequent running on fuels of low cetane number was accompanied by blue-white smoke in the exhaust until the engine had become thoroughly warmed up.

It was found that some engines are very critical to cranking speeds and will fail to start unless this speed is above a certain minimum. The engines most critical in this respect are those having open nozzles.

Performance data obtained from the same engine at two different operating speeds and using 40 and 60 cetane fuels are shown in Fig. 2. At 900 r.p.m. the density of the exhaust smoke was substantially the same with both fuels over the entire load range. Fuel consumption was fully as good with the 40 as with the 60 cetane fuel at all loads. At 1800 r.p.m., however, the 60 cetane fuel was slightly superior to the 40 in respect to both fuel consumption and exhaust smoke. On a volumetric basis the consumption was materially less with the fuel of a low cetane rating.

Having found that the 40 and 60-cetane fuels, which cover approximately the range of commercially available products, in this engine gave the same degree of satisfaction as regards ease of starting, power, economy, exhaust smoke and knock, tests were made to determine the fuel of lowest cetane rating that would give such satisfactory performance. It was found that at 900 r.p.m., under a load corresponding to about 40 lb. per sq. in. b.m.e.p., the fuel consumption was the same on all fuels having cetane ratings of over 26, and that the consumption was greater and misfiring occurred with fuels of lower cetane number. Conditions were found to be similar at 1800 r.p.m., except that the critical cetane number was about 40. There was a rapid increase in fuel consumption and in exhaust smoke with fuels of less than the critical cetane number at the speed considered. Operation on fuels of such low cetane number is practically impossible, as severe misfiring occurs.

All of the service tests made, including one from San Francisco Bay to Reno, Nev., demonstrated conclusively that, providing the ignition quality of the fuel is above a certain minimum value, there is no difference in performance with different fuels. It is obvious, therefore, the author concluded, "that correlation between laboratory tests and service performance in engines of the type used in the tests is impossible."

Fuel Efficiency Realized for the Higher Speeds

AVERAGE fuel mileage is no better today than it was five years ago, in spite of improvements tending toward higher efficiency, said Alex Taub in his paper on "Fuel Consumption." This is due to the higher speeds at which cars are now being driven. Real improvement in the fuel mileage has been made only for the speed range from 40 m.p.h. up. The important factors which contribute toward improvement in the high-speed fuel mileage are that all carburetors now have two operating mixture ratios, one for full throttle and a leaner one for part throttle; a reduction in heat rejection at high speeds, and the wider speed range of present-day engines, which permits operation with high inlet-manifold vacuum even at high speeds and gives a throttle-plate position for such speeds that, contrary to the general opinion, is an aid to uniform distribution.

For good road economy set the tappets to the recommended clearance, the spark plug points the proper distance apart, and advance the spark to the border line of detonation; by so doing you can gain from 10 to 15 per cent on fuel mileage, provided, of course, the job is reasonably "loose" and the valves are seating.

High compression is a common approach to increased economy, but it leads to detonation and roughness. Detonation can be prevented by the use of special fuels, but there is nothing that will offset roughness. The cylinder-head material is a factor of importance in this connection. If L-head engines must have heads of high-conductivity material to suppress detonation, why not arrange for rapid heat transfer locally, where it is most needed, and for normal heat transfer at other sections of the chamber? That part of the combustion chamber where combustion originates is most subject to heat loss because it is exposed to the high temperature longest and the temperature is the highest there. The increase in the expansion ratio accompanying an increase in the compression undoubtedly has an important effect on the fuel mileage, but the lowering of the exhaust-gas contamination of the combustible charge may overshadow it.

A reduced number of engine revolutions per mile traveled is another normal avenue of attack. Overdrives improve the economy at the speeds at which they are used, but larger engines that permit of lower engine revolutions throughout the car-speed range appear a better solution, and this development has started.

Improvement in the volumetric efficiency is an aid to fuel economy, particularly at speeds above 50 m.p.h. A reduction in the internal friction improves the economy, but cars are still delivered to the public adjusted too tight for economical operation, and they are usually out of adjustment once they have been fully run in. Tin-plating of iron pistons reduced bore and piston wear in the proportion of 3 to 1. If it is not necessary to provide against rapid wear, the pistons need not be fitted so close in the first place, and with an original clearance of 0.002 in. there is a gain of two miles per gallon at 20 and 30 m.p.h., as compared with a clearance of 0.015 in.

Spark timing is a very important factor from the standpoint of economy, and should vary with the load, the additional advance required at part throttle for maximum economy ranging from 5 to 20 deg. If the spark is advanced sufficiently to give good results up to 60 m.p.h., the engine is likely to be rough at higher speeds, owing to further spark advance. This can be prevented by providing ports in the throttle shaft which cut the vacuum in and out at the desired throttle positions.

From the economy standpoint, the leanest mixture that will burn completely is the best. The limit in this respect is determined not by the ratio of the combustible mixture leaving the carburetor but by that within the cylinder. Under part-throttle conditions the proportion of burned gas in the charge in the cylinder is so high that it is a wonder the charge burns at all. With very lean mixtures the engine will miss because there is no ignitable mixture at the spark points at the time the spark passes. Changing the location of the spark plug may help in this, but that is hardly to be recommended because

it is likely to lead to trouble from detonation. Once a suitable location has been found, the best location of the spark gap relative to the combustion chamber wall should be determined by counterboring the spark-plug seat 1/32 in. deeper at each step. If the gap is too far in, the plug points will get too hot; if it is too far out, there is likely to be trouble from missing with a lean mixture. Experience has shown that the points should be 3/32 in. below the chamber wall, and never in a pocket. They will then be beyond the layer of exhaust gas that clings to the wall.

Fuel economy varies also with the length of spark gap, but the gap cannot be indefinitely increased, because this would lead to trouble in starting, as well as to plug trouble under heavy-duty operating conditions. Experience indicates that if a "hot" spark plug is used the mixture may be leaner, but here again trouble may occur in that the plug may show insufficient durability under full throttle. It may be worth while to change the water-circulation around the plug to get proper life from a "hotter" plug, because there is a difference of 1-1.5 miles per gallon at 30 m.p.h. between Nos. 7 and 10 plugs.

Good mixture distribution naturally is important. The manifold should be designed for equal air flow to all cylinders, with a minimum overall restriction. Square turns at the outside, which were considered necessary at one time, are now known to be useless because of bad flow lines. Today flow lines through the manifold are provided for a wide range of operation. Wet fuel at the end turns behaves in a definite manner at all speeds, and can therefore be allowed for in a manner that is effective at all speeds.

Exhaust dilution evidently impairs the ignitability of fuel mixtures. Today large overlaps of inlet and exhaust periods are common, as they improve high-speed performance, but such a timing allows exhaust gas to flow back into the cylinder and interferes with the ignition of lean mixtures. A timing that gives good idling characteristics makes it possible to burn leaner mixtures. Any reduction in the exhaust dilution makes it unnecessary to use an excessive spark gap and reduces the extra spark advance required for part throttle to give maximum economy, hence it makes for smoothness and long spark-plug life.

Air-Fuel Ratio Important to the Design of Engines

FOR a number of problems in connection with the design and maintenance of motor vehicles, a knowledge of the air/fuel ratio of the mixture being supplied to the engine under a particular set of operating conditions is of importance. There are available now a number of devices which measure some property of the exhaust gas, such as thermal conductivity or readiness of combustion, and some that automatically determine one or more constituents by actual removal from the gas. The usefulness of these devices depends upon the relation between the exhaust-gas composition and the air/fuel ratio. If a definite relationship is established between these two factors it may be used for the determination of volumetric efficiency and air flow when the fuel rate is known.

B. A. D'Alleva and W. G. Lovell of the G. M. Research laboratories in a paper on this subject reviewed the results of some previous investigations and then detailed their own work along this line. They used a 1934 eight-cylinder and a 1935 six-cylinder passenger-car engines, both of the valve-in-head type, and a 1935 six-cylinder L-head truck engine. Methods of measuring the air and fuel consumptions, of withdrawing the samples of exhaust gas, and of analyzing these were described, and the authors then proceeded to a discussion of the results.

Fig. 1 herewith is a graphical representation of all of the data obtained. It was found that there was no grouping of the exhaust data from any one of the engines, or from runs at any particular speed or load, which seems to justify the conclusion that the exhaust composition is related to air/fuel ratio and not to engine, load or speed. The percentages given in Fig. 1 are of dry gas. The solid lines represent compositions computed for a fuel composed of 84.9 per cent of carbon and 15.1 per cent of hydrogen, under the assumption that the relation between the constituents in the gas is such that:

$$\frac{CO \times H_2O}{CO_2 \times H_2} = 3.8$$

and that 1.875 per cent of the carbon in the fuel appears as methane, CH_4 in the exhaust. There is also, of course, the additional assumption that the air and fuel entering the engine come out in the exhaust without any selective diversion of any constituent. These assumptions seem reasonably in accord with known facts and provide a definite basis for computing the exhaust composition from fuels of different elementary composition.

The results of such computations, represented by the lines on the chart, are

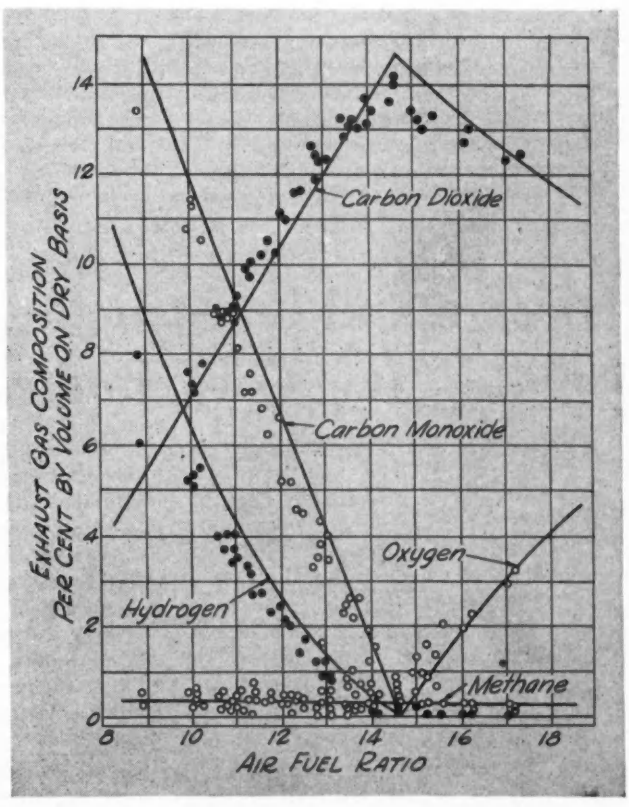


Fig. 1—Comparison of observed experimental data with computed relationships between exhaust gas composition and air-fuel ratio

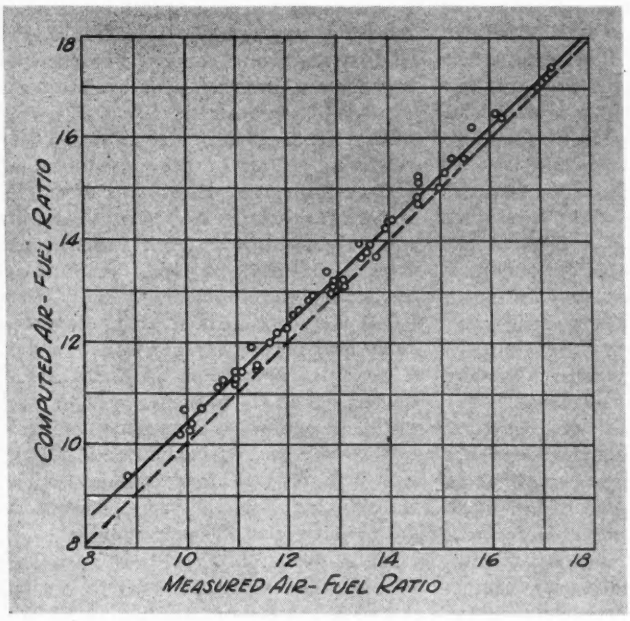


Fig. 2—Comparison of measured and computed air-fuel ratios

quite close in accord with the direct experimental data. The deviations between the observed and computed compositons are of about the same magnitude as the probable experimental error.

In addition to comparing the calculated exhaust gas composition with the observed, it is also possible, from the experimentally determined exhaust gas composition, to compute the corresponding air/fuel ratio, assuming only that there has been no selective diversion of any constituent in the engine. Details of such computations are given in the appendix, and the results of such calculations are represented graphically in Fig. 2. There, the directly measured air/fuel ratio is plotted against the air/fuel ratio computed from the observed exhaust gas composition. The correlation appears quite consistent and the computed ratio is slightly greater than the observed by about 3 per cent on the average. The cause of this discrepancy is not known with certainty, but, considering even the difficulty of measuring large volumes of air to an accuracy of 3 per cent, this slight difference has not at present seemed of major importance.

Such a chart as Fig. 1 has been found to be useful in a number of ways. A measurement of one or more contituents in the exhaust gas, instead of a complete analysis, serves to determine the air/fuel ratio, provided the engine is operating normally. Such data have been used to calibrate various exhaust gas testers which depend upon measuring one or more constituents or some property of the exhaust gas. A quick and accurate means of measuring air/fuel ratio has been found to have many applications in developing work as well as in maintenance of automobiles.

Design and Construction of the New Cord Bodies

"DESIGN and Construction of the New Cord Body" was the title of a paper by E. L. Allen, body engineer of the Auburn Automobile Company. In the design of this body full advantage was taken of the fact that the propelling mechanism is in front rather than under the body. The orthodox construction, involving body sills mounted on a chassis frame, was abandoned and these units were combined into a self-contained and self-supporting structure. This unit provides mountings for the rear springs and for some other parts normally attached to the chassis and is proportioned to take the stresses which such elements impose.

To make sure of a satisfactory joint between the body and the tractor unit (the unit comprising all the power-generating and propelling elements of the car) was one of the foremost problems encountered. Quarter-scale models of the tractor and the underbody were built to determine by actual test the strength of various coupling constructions proposed.

Since the major units of the car are interdependent to an unusual extent, the design work, involving appearance and artistic factors, the body lay-out, and the chassis designing had to be carried out concurrently. It was decided to build a practically all-steel body, and only 80 board feet of wood in all are employed in the sedan. The only wood members which really function structurally are the two roof rails which extend from the top of the front lock pillar over the doors and terminate in the rear lock pillars just above the belt. These rails average about 5 sq. in. in section. All the remaining wood goes into the rear-window frame, the rear-deck opening frame, the luggage-compartment shelf, several trim sticks, and four of the six roof bows, the two rear roof bows being fiber-filled metal channels.

From the structural standpoint the underbody, which serves also as chassis frame, is most important. It comprises two side-sill assemblies, four cross members, two wheelhouse panels and several toe-floor and seat pans. The main section of the side sills is a 16-gage channel, 6 in. high by 1½- in. wide, extending from a point 10 in. ahead of the dash to the wheelhouse panel. This member is symmetrical about a horizontal axis, hence the same stamping is used on both sides of the body. From the front lock pillars forward, other 16-gage channels are spot-welded inside the main sill channels and, for added strength, where the sill is assembled to the tractor frame, a third channel ⅛ in. thick is inserted, making the combined wall thickness at this point ¼ in. Between the first and third cross members, the sill is reinforced by a 16-gage vertical plate to form a complex box, which is further strengthened by a 20-gage door sill panel running the full length of the two door openings. This makes the sill assembly an extremely rigid double box. The various units are spot-welded together, and, in addition, the top and bottom flanges are electrically fused over their whole length.

The tractor frame is assembled to the front of the body after each unit is completed independently. The joint is effected by thirty ⅜-in. heat-treated bolts passed through holes reamed at assembly. Extensions of the side channels telescope into the ⅛-in. steel channels forming the side rails of the tractor frame. There are five bolts on each side through the vertical webs and three through each top and bottom flange. Two diagonal chassis members terminate at the first body cross member 10 in. to each side of the center of the car, where each is secured by four bolts, one through the vertical web, one through the top bevel and one through each top and bottom flange. By staggering the ends of the tractor frame where they

join the body, concentration of stress is avoided.

Because of the extreme contraction of the body panels above the belt, the conventional type of door hinge appeared out of place, especially as it was one of the aims to provide an unusually smooth exterior. The hinges selected were of the plain butt type with pins hardened and ground. As the hinge center was inside the surface of the body, it was necessary to provide clearance for the door flange as it swings back into the center pillar. To avoid the complication of undercutting the pillar stamping, the pillar was flattened off below the belt and an aluminum casting of triangular section was applied on the outside of the pillar. This casting is assembled to the pillar after the doors are hung and has proved to be quite helpful in obtaining uniform door clearance. It is bolted to the pillar, and as the holes are oversize, it can be shifted readily to the desired position. The recesses at each side of the casting provide the clearance space into which the door flanges swing.

As the strongest section of both the doors and the center pillar is at the hinge, the adjustable door checks are located in the center of the lower hinges. The center pillars, finish-casting and pillar reinforcements are symmetrical about a vertical centerline, hence the same parts can be used on both sides of the body.

Interchangeability of right and left parts was aimed at throughout, and the length to which this was carried is illustrated by the fact that each front door is identical with the rear door on the opposite side, except for the added cut-out in the rear door to provide for wheelhouse clearance.

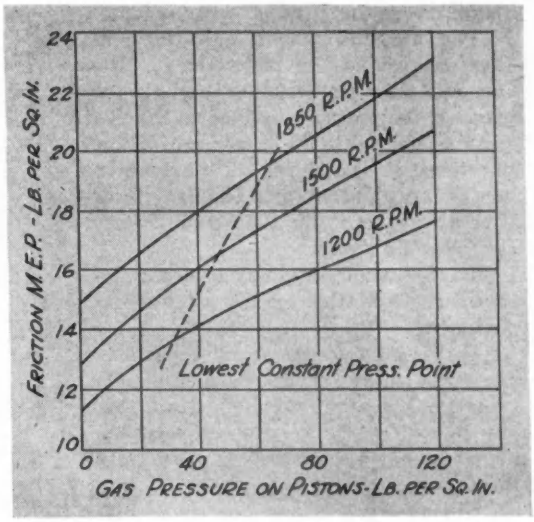


Fig. 2 — Effect of gas pressure on friction

Effect of Gas Pressure on Piston Friction Diagnosed

THE effect of gas pressure on piston friction was discussed in a paper by Morris P. Taylor, a former graduate student of M.I.T. where the experimental work on which the paper was based was done. The tests were made on a six-cylinder Chrysler 70 engine. Its valves were removed and the valve-stem guides plugged; the external openings of both manifolds were closed, so that they, the valve passages, and the cylinder formed one closed chamber. The oil and water pumps were independently driven, which eliminated external friction and also assured a constant rate of oil feed.

Three successive series of friction runs were made, the first with the valves in operation and the manifolds open (the conventional friction-test run), the second with the valves removed and the manifolds open to the atmosphere, which eliminated pumping losses, and the third without piston rings and with atmospheric pressure in the cylinders. These three tests gave the results plotted in Fig. 1.

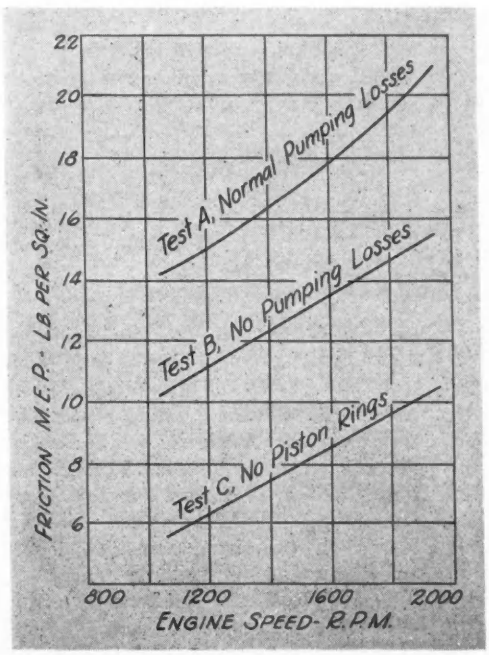


Fig. 1—Friction tests at various speeds

Next a series of runs was made with standard oil and water conditions and at three speeds, the gas pressure on the piston being increased by steps from atmosphere to 120 lb. per sq. in. gage. As shown in Fig. 2, the gas pressure increased the piston friction at all speeds, but most at the higher speeds. At the higher pressures there is substantially a straight-line relation between the pressure and the friction expressed in terms of m.e.p.

Another series of tests was run at 1500 r.p.m. with variable gas pressure at three different jacket temperatures (Fig. 3). As the jacket temperature decreased there was a marked increase in friction. In a further series of tests the gas pressure behind the piston rings was relieved by drilling 10 0.089-in. holes through the bottom of the top ring groove. A pressure gage connected to one of these holes when gas pressure was applied to the piston with the engine at rest showed that the drill holes reduced the pressure on the top ring to about 15 per cent. Running tests with the engine in this condition were made to determine how much of

the increase in friction with increase in gas pressure was due to the gas pressure behind the piston rings. Because of the air leakage through the grooves, the pressure applied to the piston was limited to 35 lb. per sq. in. The difference in the slopes of the friction curves with and without the drill holes was 22 per cent at 1200 and 25 per cent at 1850 r.p.m.

The following conclusions were arrived at from the results of the experiments:

(1) Piston friction under conditions of gas loading varies with the side pressure and the rubbing speed. At low pressures the relation is complex, but at higher pressures it is practically linear. The influence on piston friction of side pressure due to inertia is different from that of side pressure due to gas pressure, because of the different characteristics of the two with relation to the stroke.

(2) Changes in oil viscosity due to changes in jacket-water temperature have a marked influence on piston friction, but do not greatly affect the rate of increase of friction with gas pressure and speed. The explanation is somewhat uncertain, as the test results do not correlate with the absolute viscosity of the oil at the jacket-water temperatures used.

(3) The rate of increase of friction with increased gas pressure was reduced about one-quarter when the gas pressure behind the rings was relieved. On the other hand, the reduction in friction obtained by running without rings was of a much larger order, which would indicate that the rings have an adverse effect on piston lubrication.

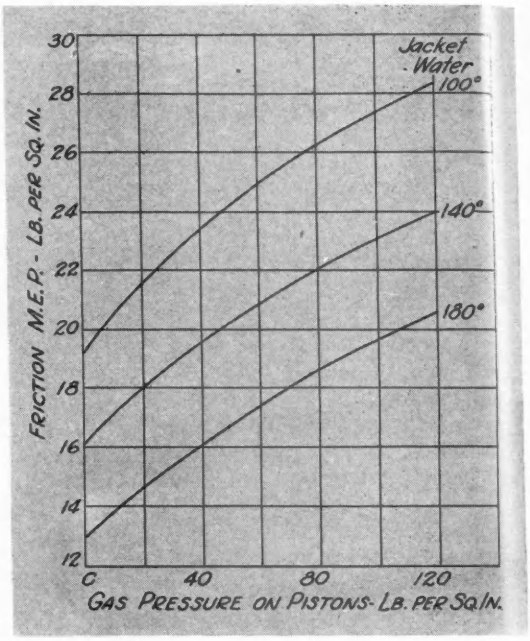


Fig. 3 — Effect of water temperature on friction

(4) For an engine of the type tested, the increase in piston friction at full load, as compared with that when the engine is run under the conditions of the usual friction test, would amount to between 2 and 3 lb. per sq. in. mean effective pressure, depending on piston speed.

Today's and Tomorrow's Cars Get a "Going Over"

A PAPER entitled "Tomorrow's Barouche" by Herbert Chase, automotive consultant and journalist of New York, dealt with what the author considered the faults of the present day car and the features of the car of tomorrow. In Mr. Chase's opinion, in present day cars too much space is devoted to mechanism and too little left for useful purposes; they are uncomfortable, unwieldy, and excessively heavy. They are too complex in construction and in operation, they cost too much to build and to operate. They are not sufficiently safe. They are not adequately streamlined. They lack many refinements and involve too many annoyances.

Better space utilization could be effected in a car with rear-mounted powerplant with rear drive. Running boards should be eliminated and the body made the full width of the car, which would make it possible to produce cars seating six passengers and providing more than the usual luggage space without exceeding the length of the present day low-priced cars. The body could readily be made a self-contained, self-supporting structure requiring no separate chassis frame. Better streamlining, not merely for style or effect, but to reduce wind resistance, is inevitable in the future car. The author still believes the two-stroke engine has possibilities and asserts it it more economical than the four-stroke at part load. Transmissions may be of the completely automatic type, in which case the problem of their control from the front end does not arise. As to systems of springing, the author thinks the independent type of suspension will be used at the rear, not because of any inherent advantages but because it may interfere less with a rear engine.

Other features advocated by the author included three-point support of the chassis, variable-rate chassis springs, elimination of sway bars, simplified shock absorbers, possibly of the pneumatic type, and fully flexible window material in place of the present shatter-proof glass.

A Remedy for Engine Roughness Prescribed

A PAPER on "Engine Roughness—Its Cause and Cure," by P. M. Heldt of *Automotive Industries*, was an enlargement of an article on the same subject which appeared in *Automotive Industries* of Aug. 10, 1935. It was shown in the paper that variations in the gas pressure in the cylinders, acting through the pistons, connecting rods and cranks, produce periodic forces on the crankcase which tend to vibrate it in a horizontal plane and that the inertia forces due to the reciprocating parts produce periodic forces on the crankcase which have horizontal and vertical components.

The conventional crankcase is stiffest

(*Turn to page* 103, *please*)

The Horizons of Business

By Joseph Stagg Lawrence

Compensations

IN appraising the decision of the Supreme Court in the Hoosac Mills Case it is well not to lose sight of the secondary effects. The immediate consequences are disturbing in many ways. Not the least of these is the effect upon the erstwhile beneficiaries of the Agricultural Adjustment Act.

In order to shed a clearer light on this problem it is necessary to define precisely the groups affected by this legislation and their importance in agriculture and the general economic life of the nation. It is generally supposed that the Agricultural Adjustment Act was designed to improve the position of all farmers, i.e., to raise the purchasing power of all farm groups to a pre-war parity with industry and commerce. Had uniform and universal farm benefits been practical there is no question but that Congress would have passed the necessary measures.

However, the number of farm products proved so great and their marketing conditions so complex that it was quite impossible during the brief existence of the AAA to extend the aid enjoyed by the cotton farmer, as an example, to all other farmers. Congress and the AAA did find means to help the producers of cotton, wheat, corn, hogs, tobacco, peanuts, rice, rye and sugar. The aid for these groups was underwritten by processing taxes and, barring the court decision, would in all probability have been permanent. Casual or emergency aid had been extended for varying periods to other producers.

Affected Groups

The fact is that the great majority of farm producers remained more or less completely beyond the pale of government assistance. The dairy farmer accounts for 18 per cent of the aggregate farm income. Although helped by regional milk shed agreements between producers and distributors consummated through the prestige and authority of the Federal government, there were no processing taxes whose proceeds were distributed to dairy farmers. Cattle and calves account for 10.7 per cent of the farm income, poultry and eggs for 10 per cent, fruits and nuts 6 per cent, and vegetables 10 per cent. None of these groups shared in the distribution of processing taxes. After isolating those affected by the Supreme Court decision it is a fair conclusion that they comprise a group of farmers whose incomes account for one-third of the aggregate farm income.

Importance

Some superficial comment tended to minimize the importance of the AAA by pointing to the above facts and adding that the total of benefit and rental payments constituted less than 10 per cent of the aggregate farm income. These two facts accentuate the seriousness of the problem. They prove that approximately one-third of our farmers were substantially dependent upon the government for cash income. Without taking the reader through the detailed calculations, suffice it to say that AAA payments during a twelve months' period from November, 1934, to October, 1935, inclusive, raised the cash income of the cotton farmer 20 per cent, of the wheat farmer 32.2 per cent and of the corn-hog farmer 35.3 per cent. These were cash payments on the margin and probably enabled more than two million farmers to purchase necessities and some of the frills of livelihood which the years of depression had denied them. It s a mistake to underestimate the importance of these payments.

Readjustment

There is another unfortunate feature of the interruption. However shocking it may seem to the rest of us to learn that a hog farmer is being paid for not raising hogs, the fact is that he made an agreement with the government which he had every reason to suppose would be continuous. In his own calculations for personal and farm outlay he counted upon future checks from Uncle Sam. Performance on his side required changes in rotation and production. All these adjustments, material and otherwise, he had made. There was in process of establishment a new balance or status. Now that the law is unconstitutional he must wrench himself out of this position and make a new personal adjustment with the world. Of course, the farmer has no more right than any other producer to expect stability. Nevertheless, he feels like a shuttlecock in the loom of politics and law propelled back and forth by some capricious force whose design he cannot understand, whose impulses he cannot anticipate.

The Other Side

After granting all the distress which follows upon such a decision, there remain compensating consequences. Only time can tell whether the two, i.e., the immediate distress and the more remote compensation, will balance. In the meantime we can point to some of these secondary effects which can be entered upon the credit side of the Hoosac Mills case account.

Under the AAA the cotton farmer was rapidly losing his dominant position in the world's cotton markets. The cut in acreage effected a substantial reduction in the crop and to this may be attributed some of the rise in world cotton prices. It stimulated the cultivation of new acreage in other parts of the world. For the first time king cotton, enthroned so long in the American South, was seriously looking elsewhere. If the South now restores its idle acres to cotton, production in 1936 will increase, the price of cotton may fall and it is possible that some of the ambitious competing areas in other parts of the world will be checked. A lower price for cotton will stimulate domestic consumption. Competing fabrics will encounter once more the vigorous rivalry of cotton. Inferior uses will again absorb substantial portions of the crop.

Greater Purchasing Power

This is the real substance of the more abundant life, i.e., more goods at a lower unit cost. The farmer may get less per pound, but he will have more pounds. The lower cost of cotton goods will increase the purchasing power of

(*Turn to page* 100, *please*)

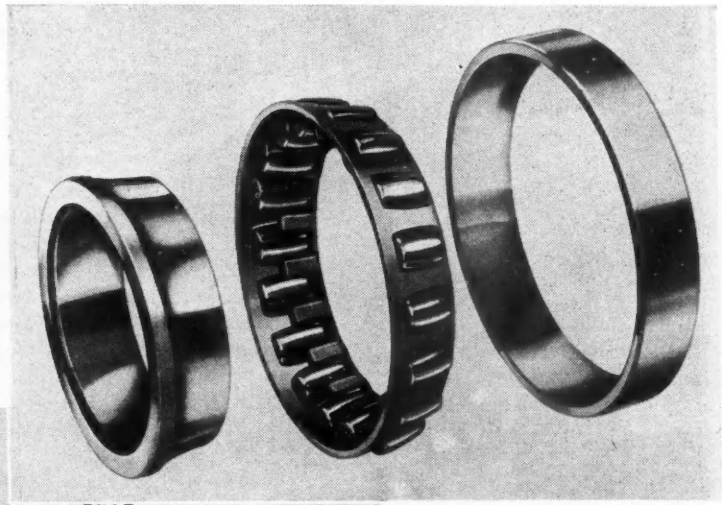
Chevrolet Trucks Have

NUMEROUS design changes have been made in Chevrolet ½- and 1½-ton trucks for 1936, including a restyling of the sheet metal and the adoption of a coupe-type cab with solid-steel top. Brake operation is now hydraulic, and the brake mechanism at the wheels has been improved. The major changes in the engine consist in the adoption of full-length water jackets and an increase in the compression ratio to 6 to 1.

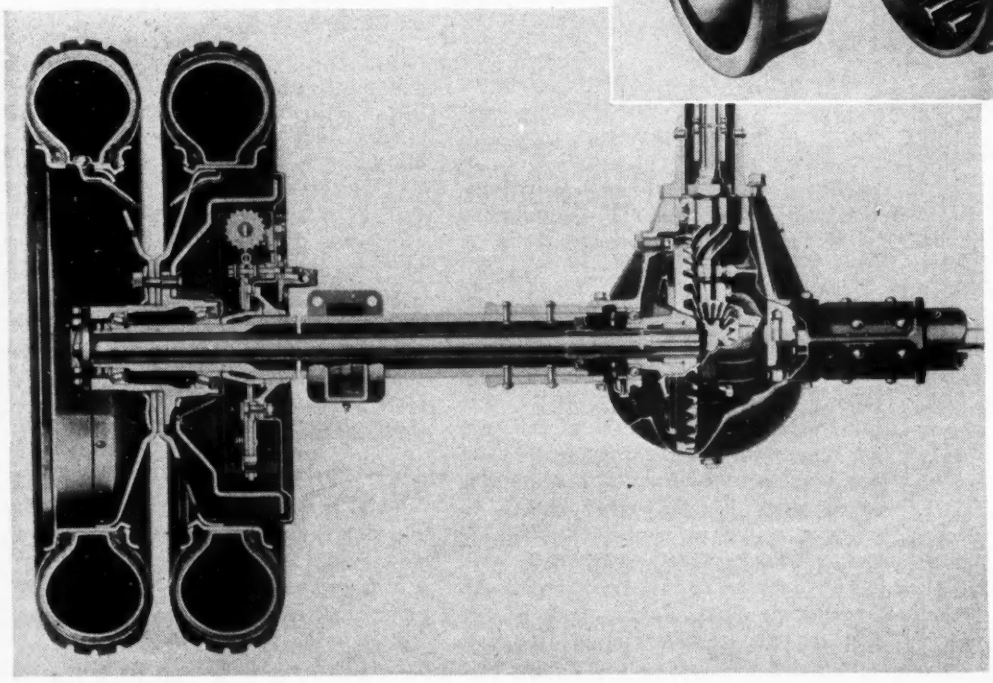
The 1½-ton chassis now has a full-floating rear axle and a stronger axle housing that includes a malleable-iron differential case and seamless-steel axle tubes. The new cab is of streamline appearance and reduced over-all height. Cowl, windshield, turret top and cab proper are combined in a single unit which is riveted and welded together and reenforced by steel braces. The underbody is of sheet steel welded to the sides. The doors also are entirely of steel while the cab interior, including instrument panel and door panels, is trimmed with steel having a crackled finish, in brown, matching the upholstery. The seat back is adjustable. The windshield, which slopes at an angle of 16 deg., may be opened by a crank regulator. Dials in the instrument panel are grouped in front of the driver, a package compartment is provided at the right side.

The radiator, hood, fenders and splash guard have been restyled in both chassis models. The sloping "V" radiator is wider at the base; the grille, formerly black, is chromium plated. The new hood carries two horizontal louvres. Front fenders, extending lower in front, have deep skirts at the sides, concealing the chassis parts. A convex chromium-plated front bumper bar has been added on the 1½-ton model.

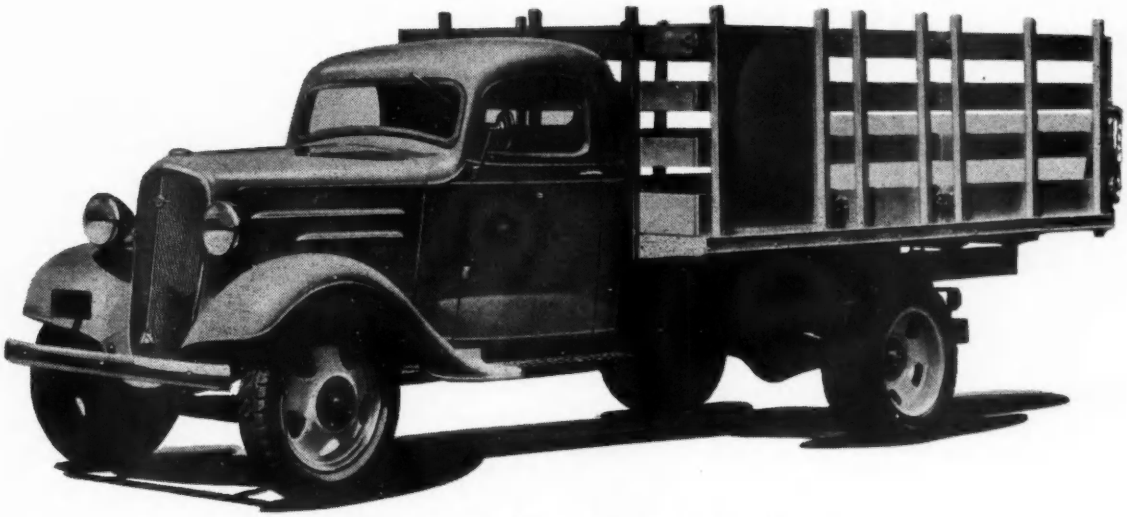
Hydraulic operation has been adopted to the regular Chevrolet brake design. A hydraulic cylinder with two pistons actuates each pair of articulated brake shoes. In the 1½-ton model the master cylinder is mounted on the frame, while in the ½-ton model it is mounted on the clutch housing. The master piston is 1 in. in diameter on the ½-ton model and 1¼ in. on the 1½-ton model. Wheel piston diameters are varied to give a suitable division of braking effect between the front and rear wheels. The hand-brake lever actuates both service brake shoes in each rear wheel. It connects through a flexible cable to a lever-and-toggle mechanism within the rear brake drums. On the ½-ton model, composite brake drums are used,



Details of new Hyatt radio-thrust bearing with barrel-shaped rollers



Sectional view of full-floating rear axle



Chevrolet 1936 1½-ton truck with stake body

Improved Brakes and New Rear End

comprising a cast-iron rim and a pressed-steel web. The outer surface of the drum has five ribs machined on it, to increase its radiating surface. On the 1½-ton model the effective braking area has been increased 56.6 sq. in., to 330 sq. in.

Engines of the two chassis models are identical. They develop a maximum of 72 hp. at 3200 r.p.m., while at 2000 r.p.m. the output is 57.5 hp. and at 1000 r.p.m., 30 hp. The maximum torque of 155 lb-ft. is well maintained over the speed range 900-1500 r.p.m.

Phantom view showing mounting of fuel tank in driver's seat independent of chassis frame

An improvement of 6 per cent in the fuel economy is claimed and is credited to the increase in compression ratio. The combustion chambers have been reshaped to assure smoothness with the higher compression. To offset the increase in the choking effect of the air cleaner as it becomes clogged with dust, the carburetor float chamber is placed in communication with the air tube.

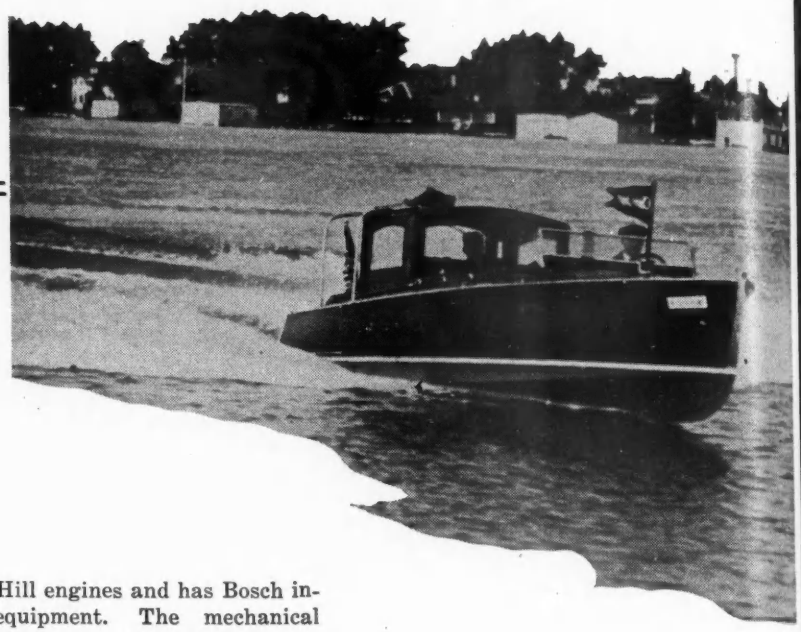
With the new full-length water jackets the oil temperature runs 30 deg. lower than formerly, when it would sometimes exceed the water temperature by 100 deg. F. Oil supplied to the valve-rocker shaft is further lowered in temperature by about 10 deg. by carrying the copper tube conveying it to the hollow shaft through the water jacket of the cylinder block. Changes have been made in the radiator cores of both models. That of the ½-tonner is now made of copper, the same as the core on the larger model, while the core of the latter now has increased fin area.

Generators are provided with ventilators which maintain their operating temperature at about 80 deg. above that of the atmosphere.

Clutch improvements include the use of the new shot-blast process of treating the cushion springs of the discs. The steering gear of both models now

(*Turn to page* 104, *please*)

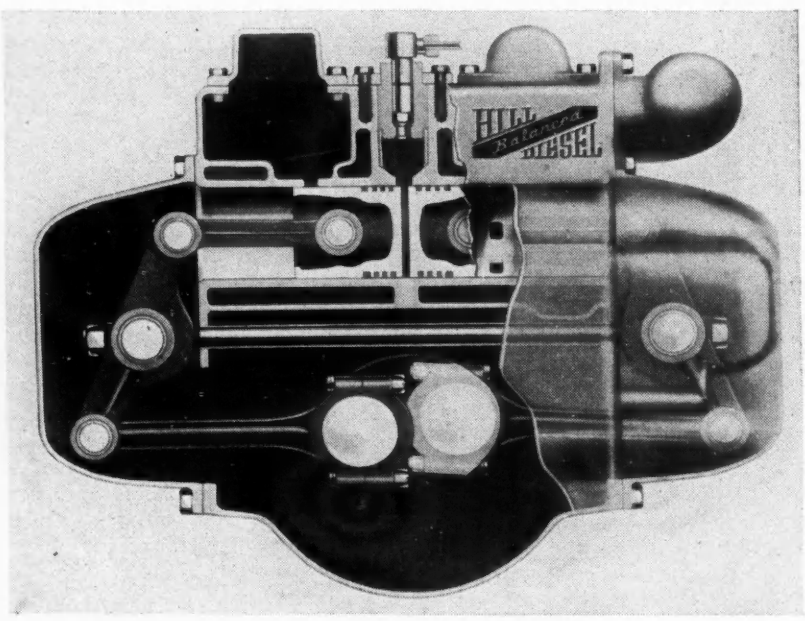
Power Plant Development Is



Hill Engine Company Shows Balanced Diesel

HILL DIESEL ENGINE COMPANY will exhibit the Hill balanced Diesel, a single-cylinder opposed-piston two-stroke engine of 2½-in. bore and a 3½-in. stroke of each piston. The two pistons connect through short connecting rods to rocker levers at opposite sides of the engine, from which rocker levers connection is made through conventional connecting rods to a two-throw crankshaft below the cylinder. The engine is provided with the precombustion chamber used in previous Hill engines and has Bosch injection equipment. The mechanical parts are balanced, the construction is unusually simple, embodying a minimum number of parts, and pistons are very accessible, so that piston rings can be replaced in minimum time. It is claimed that the engine is readily started from cold without the use of auxiliary apparatus, and that it will burn any good commercial grade of fuel oil of 22 Baume or more, up to and including kerosene. Lubrication is by pressure throughout, and the engine has no external oiling devices. A governor controls the maximum speed. There are no gaskets under pressure. The overall dimensions are only 24 by 25 by 22 in., the latter being the height.

An engine of the type described, for marine propulsion, complete with clutch and reverse gear, will be exhibited at the New York Show. Its normal operating speed is 1200 r.p.m., the maximum speed, 2000 r.p.m. The weight of the assembly, including the reverse gear, is approximately 475 lb. A 5-Kw. generator set will also be shown. Engine and generator together are mounted on a sub-base complete with radiator and fan. The weight of this unit is 800 lb. and its normal operating speed 1200 r.p.m. The engine described in the foregoing, with a horsepower rating of 10-15, is the only one of this type in production at present, but several larger sizes are under development.



The Hill Diesel Engine Co. is showing a single-cylinder powerplant

Regal Displays 2-Cyl. Vertical for Fishermen

REGAL MARINE ENGINE COMPANY, Coldwater, Mich., will exhibit a two-cylinder vertical engine designed for fishing and commercial boats. All castings are of alloy iron and the crankshaft is of chrome-nickel steel, heat-treated. Cylinder dimensions are

Keynote of Motor Boat Show

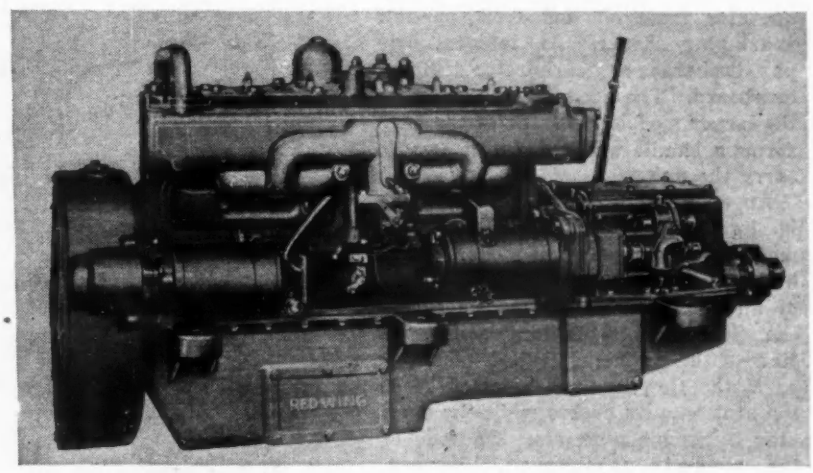
6 by 8 in. and the weight is 2660 lb. It is claimed that when the engine is delivering 28 hp., its rated output, its fuel consumption will not exceed 2 gal. per hour. Bosch injection equipment is used and a Leec-Neville 32-volt generating and starting system. Main bearings are of 3½-in. diameter.

Red Wing-Waukesha Comet Diesel Being Exhibited for the First Time

RED WING MOTOR CO., Red Wing, Minn., will show for the first time one of the Red Wing-Waukesha Comet Diesel models, the 75-100 hp. size, which has six cylinders of 4⅜-in. bore and 5⅛-in. stroke, and can be run at up to 1500 r.p.m. for steady service. Two other sizes of this type are available, the 100-125 hp. of 4¾-in. bore and 5½-in. stroke, and the 120-140 hp., of 5-in. bore and 5½-in. stroke. Comet Diesels are available in opposite rotating pairs, for twin-screw installations; also with built-in reduction gears with ratios varying from 2 to 1 to 3 to 1.

Red Wing Hesselman moderate-compression, spark-ignition, fuel-oil engines have been exhibited at previous New York shows, but there will be one new model at the coming show, a six-cylinder of 65-75 hp. It has a bore of 3¾ in. and a stroke of 4¼ in. (292 cu. in. displacement), and its speed ranges up to 2000 r.p.m. It is available either in the direct-drive or in the reduction-gear type and is specially designed for installation in medium-sized cruisers. Hesselman engines are available in three other six-cylinder and three four-cylinder sizes.

Hesselman engines for 1936 have the new design of cylinder head, in which the injectors and spark plugs are held at an angle, extending into the cup-shaped pistons. This new head is said to give increased output and to eliminate spark-plug fouling. Another new feature is the vacuum fuel control, which automatically controls the amount of fuel injected per cycle in accordance with the engine speed and load. Red Wing Hesselman and Comet engines are now equipped with a thermostat which controls the engine temperature. The cooling water does not pass through this thermostat, but through a jacket surrounding it, which assures proper operation and long life in salt-water as well as in fresh-water service.

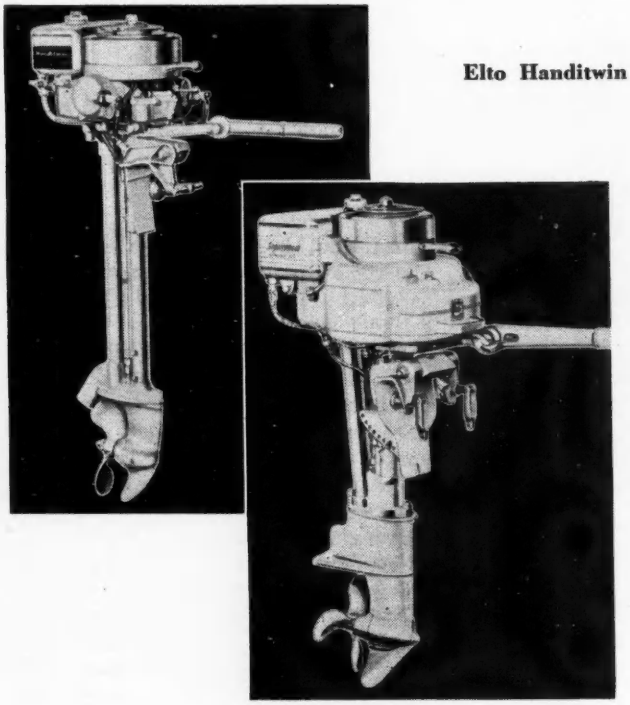


Six cyl. Red Wing "Hiawatha" gasoline model has a 52-85 hp. range

Red Wing gasoline engines at the show will include representative models from the 18 sizes of 4 to 125 hp., including the new high-speed six-cylinder model for 1936, the "Hiawatha." This new model has a bore of 3¾ in. and a stroke 4¼ in. (282 cu. in.), and develops from 52 hp. at 1500 r.p.m. to about 85 hp. at 3000 r.p.m. This model is for the faster runabouts and medium-sized cruisers, and is available with reduction gear.

The "Hiawatha" Six has a seven-bearing crankshaft of 2⅝ in. diameter, and is pressure-oiled to all working parts, including the piston pins.

Evinrude's 1936 Line is "Hooded"; Has Quiet Under-Water Silencing



Elto Handitwin outboard motor

The Sport four is said to deliver 30 m.p.h.

FOR 1936 the complete Evinrude line of Outboard Motors Corporation is "hooded" and has quiet under-water silencing. The aluminum "hoods" protect the spark plugs, wiring and carburetor from waves and spray, and the operator from oil and from possible spark-plug shocks. An integral drip pan discharges any carburetor dripping overboard. The hoods are light and in the larger models the front of the hood forms a handle which makes it easy to carry the unit.

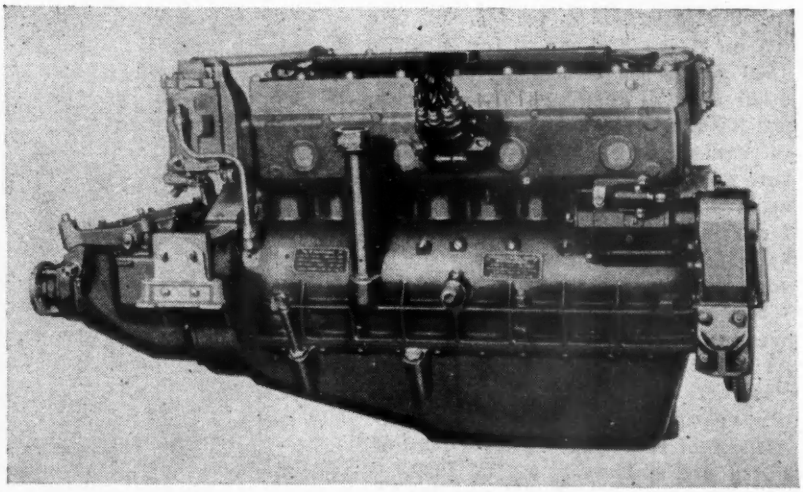
An automatic exhaust cut-out, which is slightly open at starting and automatically water-sealed at moderate and high speeds, is now standard equipment of all Evinrude service models except the Speediquad. Medium and large sizes of the engine are rubber-mounted, as is the Co-pilot, which latter keeps the boat on a set course while the operator lights his pipe, etc. On four of the models (Fisherman, Lightwin, Lightwin Imperial and Lightfour Imperial) the propellers are cushioned in rubber, which saves pin shearing when hitting rocks and sunken logs. There are eight basic Evinrude models, including one single-cylinder, four "twins" and three "fours."

The single-cylinder Sportsman now has a streamlined lower unit provided with grease seals which retain the gear lubricant. Other improvements in this model include an exhaust outlet which discharges the exhaust gases more directly into the propeller slip stream, a semi-automatic choke which facilitates starting, and a fast-operating lever for carburetor setting. A new Zipper suitcase-type carrier is offered for this model, which weighs only 24.5 lb.

Electric starters are being offered on the Sportfour and Speediquad models at $50 extra. The electrical units are dynamotors and when the engine has run up to speed they charge the 12-volt battery that goes with them.

Outboard Motors Corporation in recent years also has gone into kindred lines to which its engines are well adapted, such as those of motor lawn mowers, portable high-pressure pumpers and engines for bicycles.

The Elto line of Outboard Motors Corporation for 1936 comprises four models, starting with a 22.5 lb. model listing at $45. The horse powers of all engines are N.O.A. certified. The new Eltos have under-water silencing, and the three leading models are equipped with automatic exhaust cut-outs which discharge the exhaust gases into the open air when starting and running very slowly. The smallest model, the Elto Ace, develops 1½ hp. at 3500 r.p.m. This model and its companion, the Handitwin, are supplied with magneto ignition only. Features of this low-priced model include a Co-pilot, a rubber-mounted steering handle, a diamond-bored cylinder, an aluminum piston and a case-hardened nickel-steel

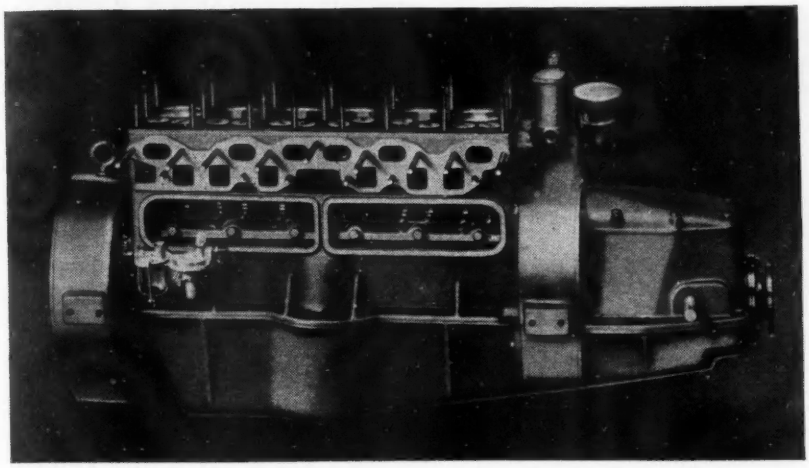


The Chrysler straight-drive Royal 8

crankshaft. The Handitwin, of 2.5 hp. rating at 3500 r.p.m., weighs 29½ lb. Its lower unit is streamlined and its propeller is of the two-blade type and "semi-weedless." The other two models of the line are the Service Twin and the Speeditwin. The Service Twin is supplied with either magneto or battery ignition, is of the opposed-cylinder type, and has aluminum pistons. The lower unit is of bronze and the propeller, which is of the weedless type, can be adjusted for depth through a range of 6 in. A reversing Service Twin is also offered, which is provided with an overwater exhaust and weighs about 4 lb. more, but is otherwise identical with the regular Service Twin. The entire engine pivots, but when it is running in reverse it is automatically prevented from tilting.

A feature of the Speeditwin is an internal rotary valve integral with the crankshaft. A Flash-Start primer on the carburetor in conjunction with a compression release is claimed to make starting easy. This model can also be supplied with electric starter.

Gray Co. Showing Two Lines; Medium and High Duty Types



Gray Six has individual intake parts for each cylinder

GRAY MARINE MOTOR COMPANY will exhibit samples of its two lines of marine engines, the medium and high-duty type for heavy cruisers, houseboats and larger charter boats, and the Phantom series for runabouts and hydroplanes.

The Gray Six-51 and the Six-71, of the first-mentioned series, are being offered for 1936 with increased bore and stroke, but the installation dimensions, appearance and equipment remain the same. The cylinder dimensions of the Six-51 are now 3¼ by 4 in., making the displacement 200 cu. in., an increase of 17.6 per cent. This engine is rated at 53 hp. at 2000 r.p.m. and 65 hp. at 2800 r.p.m. Its certified weight is 650 lb., all iron construction, fully equipped. The Six-71 now has cylinder dimensions of 3¼ by 4⅜ in., making its displacement 218 cu. in., which is an increase of 5 per cent. This model is rated at 62 hp. at 2000 r.p.m. and 70 hp. at 3000 r.p.m. Its certified weight is 665 lb., all iron, fully equipped. Both engines are 42¾ in. long and are identical in outside dimensions and appearance. Their specific output is claimed to be high and this is ascribed to the system of "individual porting" employed, which is also found on the Six-91, on the Four-40, and on the entire Phantom series.

A number of refinements have been made in the two larger members of the heavy-duty series, the Six-95 and the Six-105. A manifold of new design, improved cam forms, and improved carburetion have raised the horsepower curve by from 7 to 10 hp. throughout the speed range from 800 to 1600 r.p.m. It is claimed that these same changes have also bettered the fuel economy. Features of these two engines are seven-bearing crankshafts of 2⅝ in. diameter, double ignition, a base clean-out plate, cylinder blocks of chrome-nickel iron, iron pistons, a flywheel pulley, removable tappet assemblies, a two-piece clutch housing, a "straight-line" pressure-lubricated reduction gear, a marine-type non-drip carburetor, and an instrument panel with tachometer. Magneto ignition, rubber mounting and rotation in the opposite direction are available, as is also an extra 6 or 12-volt generator mounted on the flywheel housing.

In the largest of the three Gray Sixes, the Six-91, the horsepower has been stepped up an average of 10 hp. at all speeds between 2000 and 3200 r.p.m. New features of this engine include rubber mounting, a self-draining Stromberg carburetor, a pressure-type demountable oil cooler, and a new design of heavy-duty pistons. The manifolding and cam contours also have been improved the same as in the other two Sixes. In the reduction-gear type the Six-91 is 54⅞ in. long, while without the reduction gear it measures only 49 7/16 in. in length. For twin screw work this model is furnished for rotation in both directions.

Gray Marine Motor Company also is building a new racing engine, known as the Gray Fireball, which is eligible for the 225 Class and the E Class. Its moving parts are said to be completely balanced and the lubrication system is claimed to perform its functions properly at speeds up to 5000 r.p.m. Only ten of these engines are being built in the first lot and shipment of one of these engines for the Florida races was made some time ago.

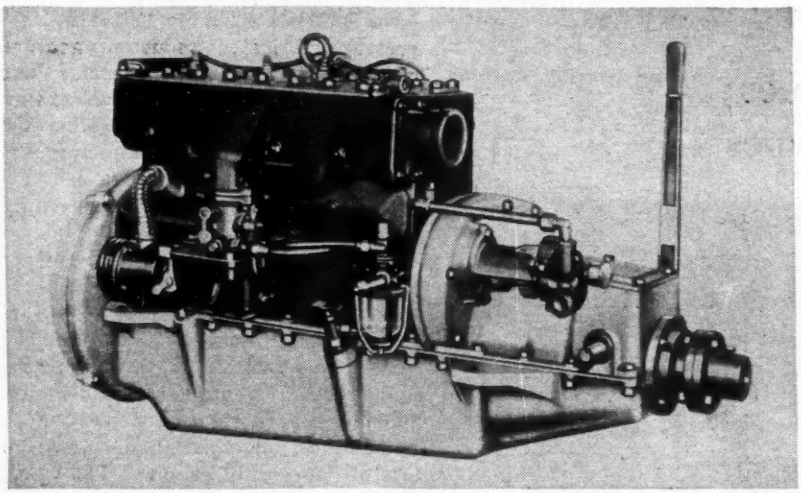
Lycoming Features Its Six-Cylinder Race Engine

LYCOMING MANUFACTURING CO., Williamsport, Pa., will feature its HUE six-cylinder 223-cu. in. racing engine and its Model UH standard six-cylinder and Model UHD six-cylinder reduction-gear engine. The racing engine, which has 3 5/32 by 4¾-in. cylinders, is guaranteed to develop 155 hp. on 87-octane gasoline, meets the specifications of the U. S. 225-cu. in. hydroplane, E runabout and International 4-liter classes. This engine is equipped with an oil cooler, a water-jacketed exhaust manifold, a gear-type of water pump with herringbone bronze gears, a Paragon reverse gear, and a 1-in.

straight-bore exhaust coupling. The engine weighs approximately 590 lb. Standard equipment includes a tachometer, starting switch, ammeter, water-temperature, and oil-pressure gages, a set of tools and a sump pump.

The Model UH direct-drive and UHD reduction-gear drive have six cylinders of 3 1/16-in. bore by 4¾-in. stroke. The reduction gear gives a ratio of 2.16 to 1. The weight of the UH is 682 and that of the UHD, 727 lb. Outputs of these engines range from 25 hp. at 800 r.p.m. to 96 hp. at 3600 r.p.m.

Universal Shows Shorter, Redesigned Marine Engines



Universal Hi-Speed Flexifour 42 hp. powerplant

UNIVERSAL MOTOR CO., Oshkosh, Wis., has redesigned some of its marine engine so as to reduce their length, thus making it possible to get them into more restricted space. The Superfour is now 6 in. shorter, and the Utility Four, electric-starter model developing 20 certified hp. at 2000 r.p.m., can now be installed in a space 35 in. long and weighs under 400 lb. net. This new model is available in direct-drive and reduction-drive form, with magneto ignition or electric-starting equipment and in opposite directions of rotation for twin-screw operation. Where space is very scanty the Universal Economy Four can be fitted, which has the same certified horse power as the Utility Four but is only 28 in. long. Magneto ignition is standard on this model but electric starting is available at additional cost. Universal also has a two-cylinder engine of 10 certified hp. at 2000 r.p.m. which is 28⅛ in. long over all. With electric starting equipment this engine weighs 345 lb. The single-cylinder Universal Fisherman engine developing up to 8 hp. at 1200 r.p.m. has been reduced to a height of 18 in. above the crankshaft axis. All of the horse power ratings of the company's engines are now certified.

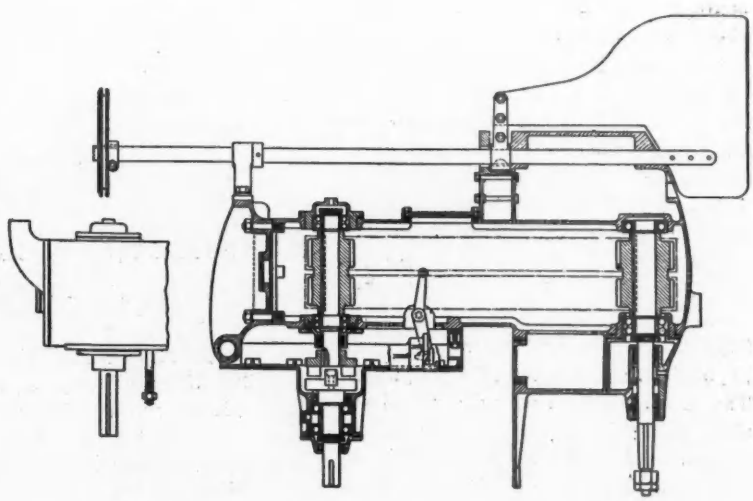
Among the features of the new Superfour are a one-piece oil pan extending the length of the engine and reversing gear, helical cut gears for the camshaft and accessories drive, and a new pressure lubricating system. The engine has 3¼ by 4½ in. cylinders and develops 45 hp. at 3000 r.p.m. The new high-speed Flexifour, which weighs 394 lb. net, develops 42 hp. at 4000 r.p.m. and is designed for use on speedboats up to 22 ft. in length. For larger boats and higher speeds the company offers the Blue Jacket Six of 3 by 3½ in. cylinder dimensions developing 62 hp. at 4000 r.p.m. The Blue Jacket Racer is built especially for racing service. With a bore of 3 7/16 in. and a stroke of 3½ in. it has a displacement of 129.93 cu. in., it develops 75 hp. at 4500 r.p.m. and weighs less than 5 lb. per hp. The net weight is 372 lb.

Universal Motor Company also offers a line of marine lighting sets ranging in capacity from a single-cylinder unit of 1000 to 2000 watts capacity to a six-cylinder unit of 10,000 watts capacity.

Muncie Outboard Motors Have Under-Water Exhaust

MUNCIE GEAR WORKS, INC., Muncie, Ind., will exhibit their outboard engines which are built in one single-cylinder and three twin-cylinder models. Among the features of these engines are under-water exhaust, gasoline control in steering handle, aluminum three-ring pistons, monel metal non-corrosive drive shafts, and combination pump and siphon cooling.

Roberts Motors, Sandusky, Ohio, will exhibit its standard 92 hp. eight-cylinder V marine engine which has 3 1/16 by 3¾-in. cylinders and weighs 556 lb. complete; and also a number of Ford four-cylinder marine conversions. Conversion D developing 50 hp. at 2400 r.p.m. and weighing 650 lb. Conversion E also is a four-cylinder model delivering 40 hp. at 2200 r.p.m. and weighing 540 lb. Conversion C-Special develops 75 hp. at 3400 r.p.m. and weighs 449 lb.



General assembly of the Gifford-Wood stern drive Model A-100

Midget racing car powered with Gifford - Wood Midshipman II marine engine

Two New G-W Stern Drive Models Shown by the Gifford-Wood Co.

GIFFORD-WOOD COMPANY, Hudson, N. Y., during 1935 developed two new models of G-W stern drive, and both of these will be shown to the public for the first time at the New York motor boat show. The A-100 stern drive is rated at 100 hp. at 3000 r.p.m. and was developed for use with the many high-speed engines now on the market. It is said to be particularly adapted for use with the many marine conversions of the Ford V-8 engine. The entire housing is in a single casting, which gives it exceptional strength. The lower section is fully streamlined, the leading edge carrying a sharp cutwater, to reduce the drag from the propeller slip stream. The outside has clean lines and the inside is heavily rubbed to enable the housing to withstand any shock to which it may be subjected. A two-strand silent chain is used to transmit the power from the main drive shaft to the propeller shaft, running over sprockets of hardened alloy steel. A chain tightener permits of adjusting the chain tension.

The main and jack shafts are made of chrome nickel steel, while the propeller shaft is made of heat-treated Tempaloy bronze. Double oil seals on the top drive shafts and quadruple oil and water seals on the propeller shaft insure the retention of the lubricating oil, and exclude water. The propeller shaft has a standard SAE taper. All shafts are mounted in heavy-duty ball bearings. In addition to the ball bearings, the propeller shaft is supported at its outer end by a Goodrich cutless rubber bearing.

The drive is available in the stationary type for bolting direct to the transom, or in the tilting type provided with a stern bracket which bolts to the transom, the drive proper being supported from this bracket by a special pivot shaft. In use the drive is securely locked to the stern bracket by a shear pin. If an obstruction is encountered the pin shears and allows the drive to swing free.

Either aluminum or bronze construction can be furnished, the aluminum being recommended for use in fresh water, and the bronze for use in salt, brackish or heavily polluted waters.

The manufacture of smaller sizes of this stern drive is continued, as is the manufacture of the Midshipman II inboard engine, a four-cylinder horizontal opposed engine available in two models ranging from 28 hp. at 2800 r.p.m. to 33 hp. at 3200 r.p.m.

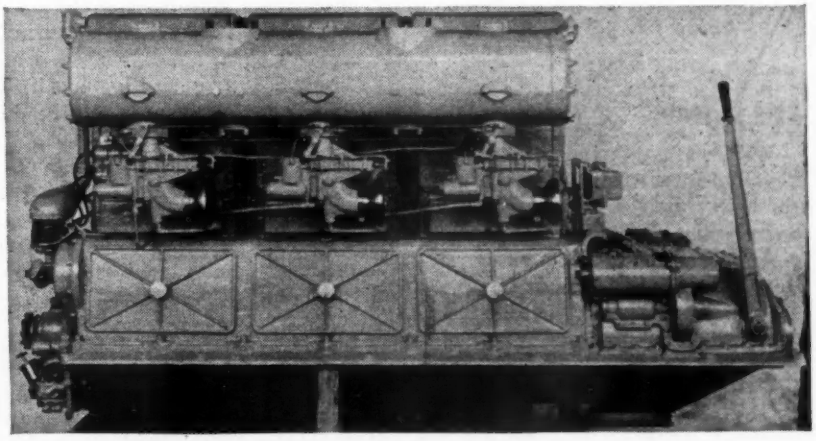
A feature of attraction at the exhibit will undoubtedly be a midget racing car with a Midshipman II engine which is to be shown at the stand. The success of this car has led Gifford-Wood now to design a special model of the engine for this service. The new job will be of right-hand rotation for operating speeds of well over 5000 r.p.m. The added speed is achieved by means of oversize intake and exhaust valves, completely machined intake manifolds, a special racing camshaft, magneto ignition and a special clutch.

(*Turn to page* 100, *please*)

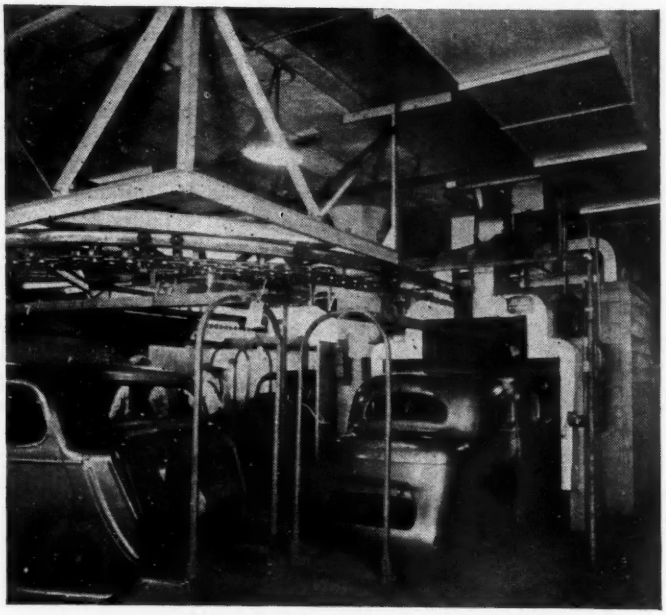
Murray & Tregurtha to Show K-6, a Six Cylinder Engine

MURRAY & TREGURTHA, INC., North Quincy, Mass., will show the K-6, a six-cylinder, 325-hp. gasoline engine, specially designed for commuters, high-speed cruisers, and large, fast runabouts. We are informed that 21 of these engines have been purchased by the U. S. Coast Guard for the new 38-ft. picket boats. A second engine to be shown is the Model M-4, a four-cylinder design also operated on gasoline. Then there will be the Model OCX-6, a six-cylinder fuel-oil engine equipped with the Shore carburetor-manifold system. It is rated at 145 hp. at 800 r.p.m. and 175 hp. at 1100 r.p.m. A number of engines of this type have been installed in heavy boats during the past two years, including a Coast Guard patrol boat and a U. S. lightship.

The Shore carburetor-manifold equipment "processes" the fuel oil before it enters the cylinders. The engines are started on the same fuel that is used for running and handled in the same way as standard gasoline engines. The fuel oil is said to be broken up into a fine mist and when this passes through the heated intake manifold it is vaporized.



Murray and Tregurtha six-cyl. oil engine generates 145-175 hp.



Painted bodies entering the drying ovens at the Packard plant

PRODUCTION LINES

OPTIONS, Options.

On occasion we have discoursed on the variety of options in passenger car assembly. That it's not confined to passenger cars we learned in our brief visit at General Motors truck. They're coming through with twelve different models in the conventional line alone. Seven different engines—three models on which engine model is optional. Deluxe cabs, deluxe equipment, axle and transmission options, help the thing along. Then multiply by twelve standard colors, and seven deluxe colors. Stir some more and multiply again by wheelbase options—from two, three, and four per model. Then consider body styles and why go further. . . . We are ready to admit that truck production has graduated into a most complex operation. Which confirms the impression forced on us some time ago when we studied the new Dodge truck plant.

Oil Filter

Within a month you will hear about a novel oil filter which has been groomed for heavy duty vehicles—trucks, buses, and the like. It's built on the same principle as the maker's line of service station oil rectifiers and is expected to free crankcase oil of all impurities including fine colloidal suspensions which are sometimes found after the oil has been subjected to high temperatures, pressures, and crankcase atmosphere. Because of the type of applications, it is expected that the filter will be cleaned at regular intervals to assure constant cleaning of the oil. It's intended particularly for fleet operators.

Press Cushions

A brief but comprehensive description of an improved line of air cushions is given in a new bulletin recently issued by the Clearing Machine Corp., makers of modern press equipment. This 21-page book takes up the great variety of clearing air cushions for every purpose. It should be of more than usual interest to our brothers in the press shops.

Accurate Shafting

We learn from a bulletin just come over our desk that Bliss & Laughlin is producing steel shafting to precision standards. You can get the shafting in the following forms — turned and ground, turned and polished, drawn and ground, drawn and polished. Turned and ground shafting 2 7/16 in. diameter or less is produced to exact size not more than 0.002 in. minus. Which is more or less indicative of the great improvement in quality that the industry may expect from its progressive suppliers.

Builds Own

We spent an interesting afternoon recently in the General Motors truck plant in Pontiac. Here is one of the biggest manufacturing operations in the industry. And you will see evidence of the fact in *Automotive Industries* very soon. Incidentally, GMC builds its own engines from the ground up in a special engine plant in Pontiac, and they build engines that are really big, although it's hard to appreciate their size by looking at a photo.

Bleeding 'Em

A look in the factories shows some interesting ideas on bleeding the brake lines in hydraulic brake systems along the main assembly lines. At Dodge truck, they have long narrow troughs on each side of the line at the point where the brakes lines are filled. The brake fluid pressure line is attached to the main cylinder and the fluid is permitted to flow freely at the four wheels until all air bubbles are clear, then the operators shut off the brake valves leaving the entire system filled. At Pontiac, the operators carry small individual troughs which are hung off the wheel. Here, too, the fluid starts at the main cylinder and flows into the containers until the lines are clear.

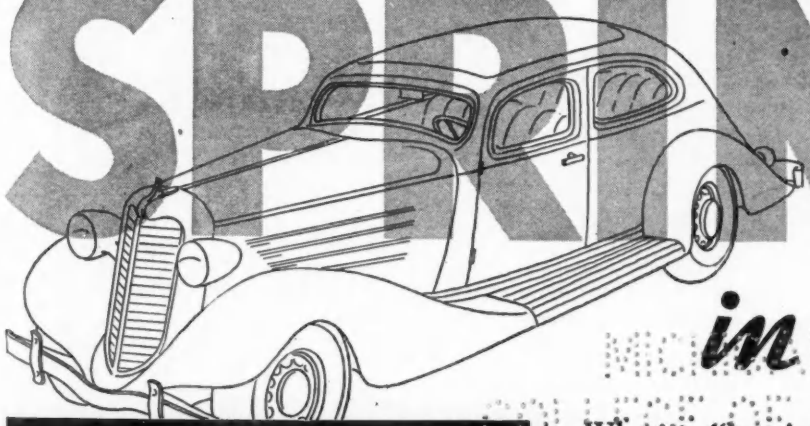
Pitt'n On

One of the car plants has a way of assembling tires for the production conveyor that makes the usual way of doing the job look positively silly. It takes a small radial drill with a fixture that rolls the carcass into place. Equipment relatively inexpensive, operation very fast, manual effort nil. No good reason why any large sized repair shop or service station couldn't rig up to it the same way. See us for details.

—J. G.

MANUFACTURING MANAGEMENT METALLURGY

over 746 UNSEEN SPRINGS in every car



What a "beating" the modern motor car takes! Terrific impacts at high speeds . . . gruelling vibration . . . extreme temperature changes . . . constant use. Month after month . . . these causes of looseness, squeaks and rattles pound away. Yet the motor car remains safe . . . smooth-running—because of 746 "unseen springs." 746 live, continuously working Spring Washers—in every car—retard wear —compensate for play and looseness. Only a Spring Washer has this *Live Action!*

SPRING WASHER INDUSTRY

Power Plant Developments Motor Boat Show Keynote

(*Continued from page* 97)

Evansville Displays Valve-in-Head Designs

EVANSVILLE GAS ENGINE WORKS, Evansville, Ind., will exhibit one and two-cylinder gasoline marine engines of conventional design, in outputs ranging from 3¾ to 22 hp. The engines are of the valve-in-head type and have integral cylinder heads, offset crankshafts and hollow connecting rods.

Seaman Motors Showing Its Uniflow

SEAMAN MOTORS of Milwaukee, who manufacture a small two-stroke engine known as the Uniflo, temporarily abandoned the marine field and concentrated on the industrial and agricultural fields. They have now returned to the marine field, however, and will exhibit their latest two-stroke marine engine.

U. S. Motors Introducing A New Six-Cyl. Diesel

UNITED STATES MOTORS CORPORATION of Oshkosh, Wis., is introducing six-cylinder Full-Diesel engine generator sets for the marine market, in capacities from 10 to 40 kw. Features of these engines include an all-bronze circulating pump and a water-cooled exhaust manifold. The sets are mounted on rubber which has been impregnated with a material that is claimed to make it oil-proof. This is claimed to prevent the transmission of noise and vibration throughout the boat, a feature that has given some trouble in the past.

Cederburg Exhibiting Two New Thors

CEDARBURG MANUFACTURING COMPANY will exhibit two new Thor outboard engines. The single-cylinder weighs 37 lb. and develops 2.4 hp. It has a bore of 2 3/16 in. and a stroke of 1⅝ in. Features of design include a two-ring aluminum piston and a two-piece phosphor-bronze connecting rod. The crankshaft is counterbalanced and all bearings are self-lubricating. The carburetor was specially designed for this engine. Gears are of chrome-nickel alloy iron. The propeller is of the weedless, two-blade type and is made of bronze. The water pump is of the plunger type and such parts as the crankcase, gear housing, etc., are of pressed steel, cadmium plated and painted.

The two-cylinder job weighs about 45 lb. and develops approximately 5 hp. It is similar in general design to the single-cylinder model.

Cedarburg Manufacturing Co., starting from scratch, has produced about 4500 units to date; it reports that orders for the new models are very gratifying and that it plans to turn out about 10,000 during the coming season.

Palmer Bros. Has Wide Range

PALMER BROS. ENGINES, INC., Cos Cob, Conn., will exhibit samples of its very extensive line of marine engines. The exhibit will be featured by Model V-8 and Models A and B Ford marine conversions. The V-8 conversion has a cast-iron base cast with timber lugs; the Palmer multiple-disk clutch, a water-cooled exhaust, a single water outlet to keep both blocks at a uniform temperature, a single exhaust outlet raised about the water line, and both starter and generator in elevated positions where they are protected against moisture.

The Horizons of Business

(*Continued from page* 89)

all consumers who in the aggregate far outnumber the producers of cotton. The automobile industry rose to its present high estate by turning out a superior product at ever declining prices, thus broadening the base of consumption. This is the authentic means of raising the standard of living. The theory of limited output by the producer and higher unit cost is, as a means of attaining the more abundant life, a specious interloper.

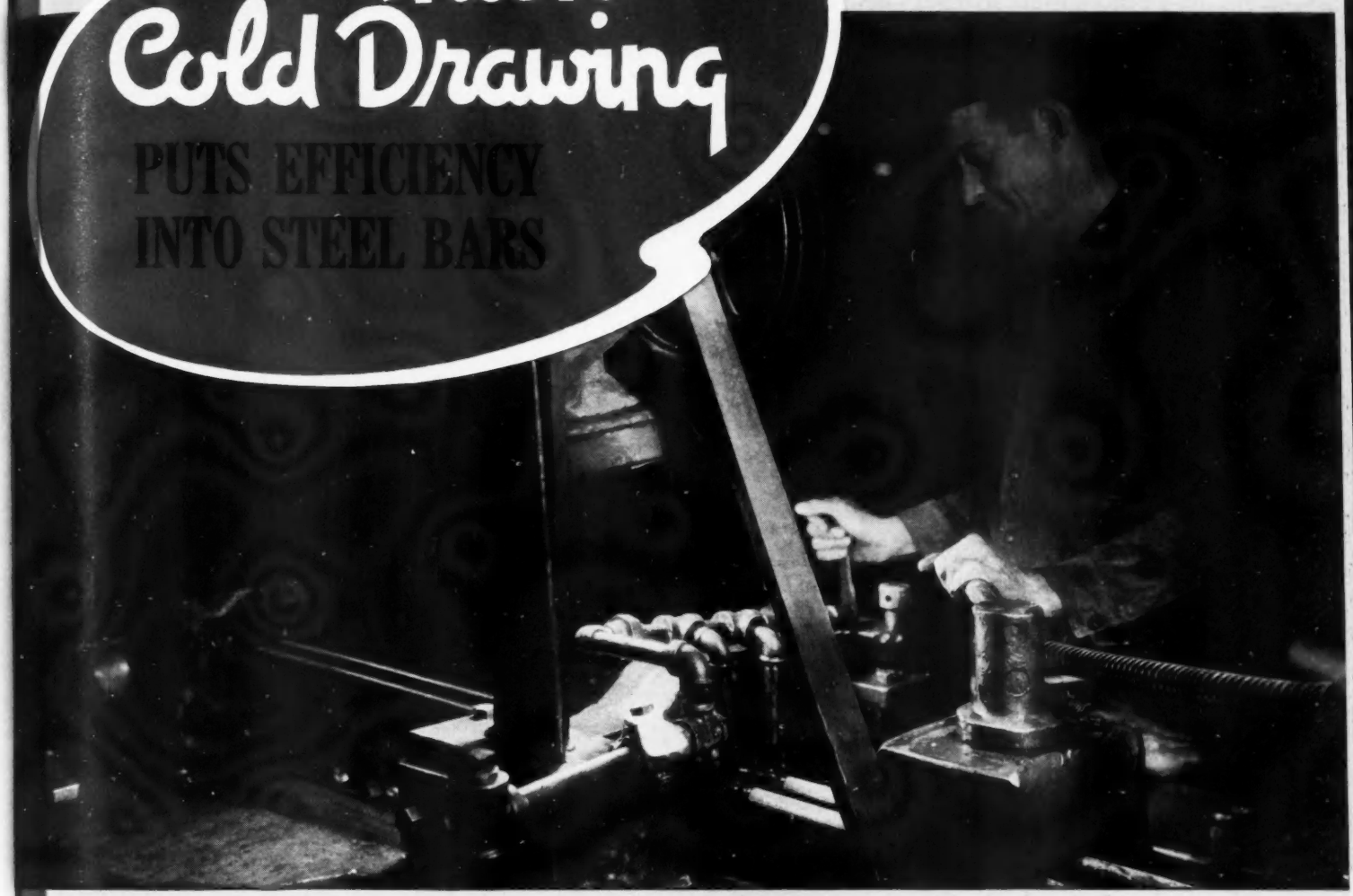
We do not mean to imply that the production of an automobile and a bale of cotton are strictly similar, that unregulated production of either or both is desirable, that an increase in output will in both cases have the same results and that these results are invariably salutary to both the producer and the consumer. There are many qualifying circumstances. We merely say that a reversion of cotton production to its pre-AAA status will avoid certain serious problems, e.g., the reduction of cotton to a domestic basis, that it will have certain desirable effects which will compensate in part if not wholly the losses sustained by the demise of the AAA. Obviously these considerations may with some modification be applied to hogs and wheat.

Motor Body Blueprints

George J. Mercer, 7310 Woodward Avenue, Detroit, has issued a new book for motor body workers under the title "Motor Body Blue Print Technology." The first four chapters of the book explain the body drawing or blue print, while the next three explain how to "balance" or "tip the panel" from the car position as drawn on the body draft to the position required for die work. The method of obtaining the sections is also dealt with in detail. Other chapters deal with the determination of the weld line and the welding operation, simple geometrical problems as applied to body work, the use of the protractor, the vernier, and the micrometer. The price of the book is $3.50.

Union Cold Drawing

PUTS EFFICIENCY INTO STEEL BARS



Promote Efficiency

WITH UNION COLD DRAWN STEELS

● Greater machinability in steel bars speeds up your production. Accurate cross section and smooth, bright finish eliminate the need of machining operations to obtain these features. Higher tensile strength and wear resistance improve the life of finished products. These are some of the important qualities which Union Cold Drawing provides to make steels more efficient. For hundreds of purposes it gives these qualities to bars that are specially shaped to match the prevailing contour of required parts, thus practically completing the job. Interesting examples of such special shapes are illustrated on the next page.

In all cases, Union Cold Drawn Steels are true to analysis and uniform in quality, bar after bar, assuring you of closely controlled costs and uninterrupted production schedules.

Test the efficiency of your materials by the time, work and waste involved in putting them through production. The tremendous tonnage of Union Cold Drawn Steels consumed by industry is convincing proof that the steel which can be most quickly and easily converted into finished work is the most economical for you to use.

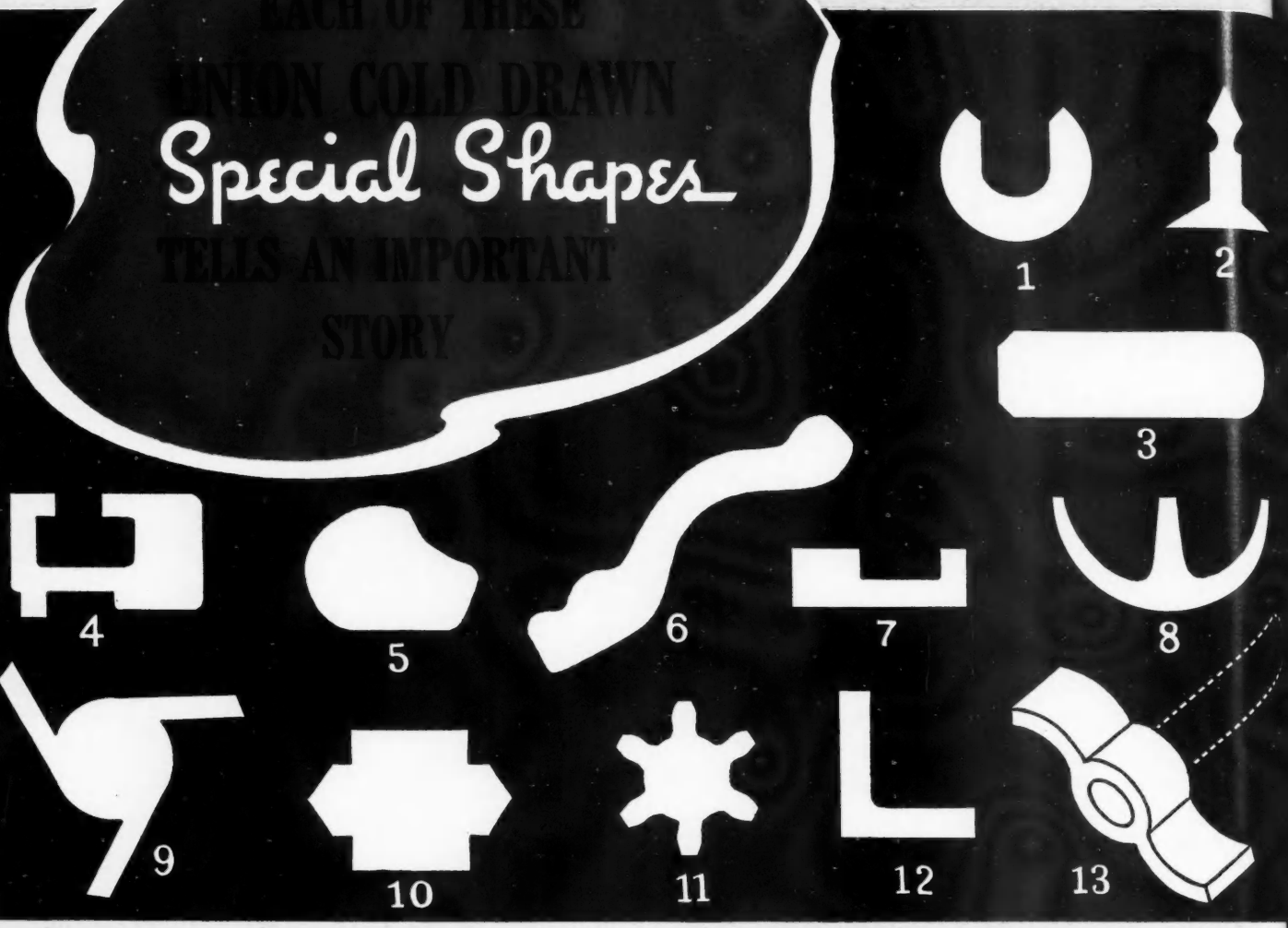
UNION DRAWN STEEL CO., MASSILLON, OHIO

Manufacturers of Efficiency Steels

SUBSIDIARY OF

REPUBLIC STEEL CORPORATION

Special Shapes



1. No machining was necessary to complete the part. The bars were simply cut to proper lengths.

2. Cold drawing provided the close accuracy necessary for the part made from this section.

3. Cold drawing gave this section the high wear resistance required for the application.

4. It would be impractical to produce this section by any process other than cold drawing.

5. Contours of this character are very expensive to machine but are readily obtained by cold drawing.

6. Cold drawing gave this section sufficient strength to eliminate the need for heat treatment.

7. This is a section of a long guide rail. To produce such parts by machining would require large and expensive equipment.

8. Cold drawing gave the part made from this section sufficient strength to permit desirable light weight and minimum size.

9. This cold drawn special shape eliminates the large waste in metal that would result from machining a standard shape.

10. Cold drawing gave this section its required sharp internal and external corners.

11. The machining necessary to complete the part manufactured from this section was made easier by cold drawing.

12. Lacquer, paint or enamel can be applied to cold drawn sections without further surface preparation.

13. This cold drawn section welded to a shaft produces a part which otherwise would necessitate a complicated and expensive casting or forging.

UNION DRAWN STEEL CO., MASSILLON, OHIO

Manufacturers of Efficiency Steels

SUBSIDIARY OF

REPUBLIC STEEL CORPORATION

Union Cold Drawn Steels

S.A.E. Annual Paper

(*Continued from page 88*)

in the vertical direction, because of its two rather deep and substantially vertical side walls, and most flexible in the horizontal direction. Since the vibrating mass in transverse vibration would be substantially the same whether the case vibrated vertically or horizontally, it follows that the natural frequency of vibration of the case is lowest for vibration in the horizontal direction, and as the speed of the engine is increased, synchronous vibration is most likely to occur first in the horizontal direction. It must not be assumed, however, that the vibration must be either horizontal or vertical; the crankcase can vibrate transversely in any direction, and if the natural frequency of transverse vibration is, say, two or three times as great in the vertical as in the horizontal plane, then the crankcase can vibrate at any intermediate frequency in inclined planes between the horizontal and vertical. This undoubtedly explains that roughness is not confined to any narrow band of frequencies, like torsional vibration of the crankshaft, but covers a very wide range of frequencies beyond a certain minimum. In other words if your engine has gotten into a zone of roughness you cannot, as a rule, get out of it by increasing the speed still further, but only by reducing the speed by closing the throttle.

Cetane Rating of Diesel Fuels Get Ratings

IN a paper entitled "Cetane Rating of Diesel Fuels," P. H. Schweitzer and T. B. Hetzel of Pennsylvania State College discussed the problem of ignition-quality ratings for Diesel fuels in general and described the Penn State ignition-lag indicator which was described by Dr. Schweitzer in an article in *Automotive Industries* of Aug. 17, 1935.

By means of this indicator the fixed-ignition-lag cetane numbers were determined for 19 different Diesel fuels and these values together with other characteristics of the fuels are given in Table I below. A determination was made of the correlation between the cetane number as found by this method and various other suggested ignition-quality indices for the same fuels. The correlation between the aniline point and the fixed-ignition-lag cetane number was found to be 89 per cent; that between the Diesel index and the cetane number, 93 per cent; that between the viscosity-gravity index and the cetane number, 86 per cent; that between the viscosity-slope index (tangent to the viscosity line on the ASTM chart) and the cetane number, 86 per cent. It is stated that if the blends of Dupo and methylnaphthalene are disregarded, the correlation coefficients for the four methods mentioned become 95 per cent, 97 per cent, 94 per cent and 67 per cent respectively. The conclusion is

Fuel Economy for Aircraft Has Proved Expensive

THE aircraft operator's viewpoint on fuel economy was dealt with in a paper by Edmund T. Allen, consulting aeronautical engineer. He said the air-transport operator in the past usually had viewed attempts to economize on fuel consumption with the suspicion that this economy would prove very expensive.

Most of such attempts, beginning with the first air-cooled engines used on air lines in 1927, were followed by a decrease in reliability and an increase in maintenance.

TABLE I

Empirical Ratings of 19 Diesel Fuels

Sample	Vis. at 32° F. Saybolt Universal Seconds*	Vis. at 32° F. Kinematic Viscosity Centi-stokes	Vis. at 100° F. Saybolt Seconds*	Vis. at 100° F. Kinematic Viscosity Conti-stokes	Gravity °A.P.I.	Sp. Gr. 60/60 °F.	Aniline Point °F.	Diesel Index	Vis.-Grav. Index	Viscos-ity Slope	Fixed Ig. Lag Cetane No.
B-1	44.1	5.69	33.6	2.28	32.9	0.8607	118	38.8	0.864	0.692	42.5
B-2	42.2	5.08	33.2	2.13	36.0	0.8448	125	45.0	0.849	0.681	43.5
B-3	45.8	6.24	34.1	2.47	37.2	0.8388	142	52.8	0.839	0.663	48.8
B-4	59.5	10.36	37.2	3.48	37.0	0.8398	164	60.6	0.829	0.674	58.5
B-5	59.1	10.23	37.2	3.48	39.7	0.8265	171	67.9	0.815	0.667	63.3
40*	42.5	5.19	33.1	2.10	19.7	0.9358	77	15.2	0.938	0.692	31.5
50†	42.6	5.22	33.2	2.13	23.1	0.9153	94	21.7	0.918	0.685	38.5
60†	43.6	5.55	33.5	2.24	26.5	0.8956	113	30.0	0.894	0.678	44.8
70†	45.0	5.98	33.9	2.39	30.2	0.8751	127	38.4	0.876	0.665	52.3
80†	46.8	6.56	34.4	2.58	33.9	0.8555	143	48.5	0.854	0.657	62.0
90†	49.1	7.32	35.1	2.81	37.7	0.8363	156	58.8	0.832	0.654	68.0
100†	52.6	8.34	36.0	3.11	41.9	0.8160	172	72.1	0.807	0.641	73.5
A	78.7	15.51	40.7	4.58	37.6	0.8368	177	66.5	0.816	0.667	65.4
B	183.7	39.45	53.0	8.46	35.1	0.8493	187	65.7	0.819	0.655	60.7
C	45.1	6.02	33.9	2.39	33.5	0.8576	126	42.2	0.858	0.673	43.9
D	103.4	21.39	44.1	5.69	37.3	0.8383	181	67.5	0.815	0.654	63.7
E	81.8	16.25	41.3	4.77	37.8	0.8358	177	66.9	0.817	0.658	60.4
S	81.1	16.08	40.8	4.63	32.9	0.8607	155	51.0	0.845	0.670	52.4
V	....	....	45.5	6.17	31.6	0.8676	162	51.2	0.846	0.660	54.3
V (68°F)	61.3	10.87	...	...	...	....	...	...	...	...	...
V (130°F)	39.1	4.08	...	...	...	....	...	...	...	...	...

*Conversion as per table given in J. Ind. Chem. 27, 82 (1935)
†Indicates volume percentage of Dupo in blends of Dupo and Methylnaphthalene

drawn that none of these methods offers a perfect substitute for engine testing but that they can be recommended for approximate ratings or for laboratories that are not equipped with a fuel-testing engine.

Reasons Behind the Scarab Design

A PAPER on "Problems of Radical Body Design" by E. L. Johnston, stylist of Stout Motor Car Corporation, was largely an outline of the features of the Stout Scarab car and the reasons behind these features. This body, Mr. Johnston said, is quite different in appearance, but it is most radical because it is "design with a reason." He held that today's cars, that is, the conventional cars, lack a sound basis of design. These designs have been judged only by one standard, viz., public acceptance, and the implication was that this was not a proper standard, because "the public can be sold anything you choose to offer it." The real test of the merit of an article, according to the author, is that it "stays sold and builds up a strong public acceptance." To do this, he said, it must function and it must be practical.

Mr. Johnston criticized conventional cars on the grounds of insufficient use of space. "Too much space is wasted upon non-functional elements; ventilation is still far from satisfactory; interiors are impractical—too cramped due to waste of available room. Visibility is sadly lacking due to the driver being located back of the center of the car; windows are poorly arranged—lights reflecting in them at night; bodies are poorly insulated against temperature and sound. Such items as recessed windows, door handles and exposed door hinges set up wind noises at high speeds.

"Headlamps are still a separate entity—not part of a unified design. Fenders are functional, of course, but should be simplified for manufacturing economy and also to produce a more compact design. Fender dies are the major die cost of today's cars.

"The engineering trend, today, is to place the engine at the rear. This is a dintinctly radical step, but one which has sound reasoning back of it. The rear engine location is functionally right. . . . Some of the problems presented by the rear engine are in engineering —mechanical as applied to structure and operating mechanisms; thermal and acoustical as applied to temperature control and sound insulation. The most important problems, however, are concerned with esthetics—the art of eye appeal. Because appearance is the first and most lasting impression made upon the public mind, sales, today, are the result, more than ever before, of visual appeal. The really serious problem in any radical departure from the conventional is the development of a design having strong eye appeal, plus sound reasons for each seemingly radical feature."

Volume Distribution in Combustion Chamber

A PAPER dealing with volume distribution in the combustion chambers of carburetor engines was presented by R. L. Sweigert of Georgia School of Technology. In the paper relations are developed for the volume burned up to any instant, for the rate of increase of this volume and for the rate of increase of this rate of increase or the volume acceleration. It is concluded that supercharging is desirable, particularly with an increase in combustion efficiency; that the chamber should be arranged to produce a minimum surface effect on the rate of flame propagation, that the area should be arranged for minimum heat loss, and that a low linear expansion is desirable except in a pocket for flame initiation.

Chevrolet Trucks Have Improved Brakes and Rear Ends

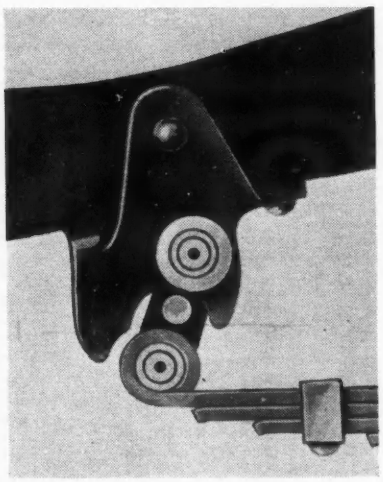
(*Continued from page* 91)

has a larger pitman shaft with longer bushings, and a larger pitman arm.

The front spring hanger of the ½-ton truck now incorporates two safety stops, to limit the movement of the axle in case of spring breakage, These are heavy lugs on the hanger, which allow normal shackle movement, but are capable of taking the entire load should the main leaf of the spring break.

In the 1½-ton models with cabs the fuel tank is now mounted under the seat, independent of the chassis frame. Two straps, near the ends, lash the tank to the cab under body, which supports the entire bottom of the tank. A flexible metallic tube connects with the fuel line leading to the fuel pump. The filler cap extends from the seat riser, so that it is not necessary to raise the seat cushion or for the driver to leave the cab when the tank is to be filled. The fuel capacity of this tank has been increased to 18 gals.

In the full-floating rear axle of the 1½-ton model the wheel load is carried on two Hyatt roller bearings of a new type, with barrel-shape rollers.



Legs on spring bracket which support chassis frame if main leaf breaks

The bearing surfaces of the inner and outer races are ground to radii which are slightly larger than the radius of the barrel-shaped surface of the rollers, consequently under light load the effective bearing area is small, and it increases with the load, as the elasticity of the material allows the rollers and races to compress.

The new bearing, which is composed of three parts, the inner and outer races and the roller-and-cage assembly, is said to be self-aligning. Each part can be serviced separately. This new type of bearing, which takes both radial and thrust loads, is claimed to have an unusually large capacity for its bulk. The rollers and both races are made of electric furnace steel. Two of the new bearings are used in each rear wheel. The inner bearing has 15 per cent more capacity than the outer one. There are 18 rollers in the outer and 19, of larger diameter, in the inner bearing.

Wire wheels used on the ½-ton trucks have been strengthened by an increase in the rim metal thickness from 0.130 in. to 0.156 in., and by a new design of the spoke holes, providing a stronger attachment of the spokes, which are riveted to the rim.